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SUMMARIES OF ACTIVE EXTRAMURAL RESEARCH TASKS OF THE MUNICIPAL ENVIRONMENTAL RESEARCH LABORATORY

MUNICIPAL ENVIRONMENTAL RESEARCH LABORATORY

JUNE 1976

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Abstracts & statistical information are presented for each active extramural project, as of July 1975. Project directors & project officers for EPA are listed to facilitate contacts by the public.

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a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
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Municipal Environmental Research Laboratory
Office of Research and Development
U.S. Environmental Protection Agency
Cincinnati, Ohio 45268

EPA-600/9-76-018
June 1976

SUMMARIES OF

ACTIVE EXTRAMURAL RESEARCH TASKS

OF THE

MUNICIPAL ENVIRONMENTAL RESEARCH LABORATORY

1975

Compiled by:

Warren A. Schwartz
Carolyn L. Stumpf
Doris M. Weber

U.S. Environmental Protection Agency
Office of Research and Development
Cincinnati, Ohio 45268

June, 1976

1a

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INTRODUCTION

The research and development programs of the Municipal Environmental Research Laboratory in Cincinnati span the areas of wastewater, water supply, and solid and hazardous wastes. MERL was organized to provide a multimedia focus for these areas in approaching the pollution control problems of municipalities and other large public institutions. Since extramural work includes many of our larger and more prominent projects, e.g., demonstrations, publication of these summaries of active extramural research tasks serves to highlight a most significant portion of our research effort.

The Wastewater Research Division develops cost-effective pollution control technology, methodology, and systems for treating liquid municipal wastes, and for handling the resulting sludges. In addition to biological and physical-chemical treatment technology, WRD is concerned with upgrading of existing plants, pollution control measures for storm and combined sewers, and the dewatering and disposal of municipal sludges. Their work extends to supporting areas such as cost studies, environmental management, water reuse, process instrumentation, and operation and maintenance of existing plants. The principal current mandate of the WRD derives from the 1972 amendments to the Federal Water Pollution Control Act, which set up a series of escalating plant performance standards for pollution control and prevention extending through 1985. A major area of impact of WRD research is on the multibillion dollar construction grant program sanctioned by the 1972 Act.

The Water Supply Research Division determines the occurrence of contaminants in water supplies, and develops and demonstrates water treatment and control technology. The WSRD concerns itself with the removal or control of organic, inorganic, and microbiological contaminants, as well as with the problems of water quality deterioration during storage and distribution, and with economic analysis and other water supply management questions. WSRD works with the health effects research programs of EPA to develop information necessary for the formulation of defensible drinking water standards. The principal current mandate of the WSRD is the 1974 Safe Drinking Water Act.

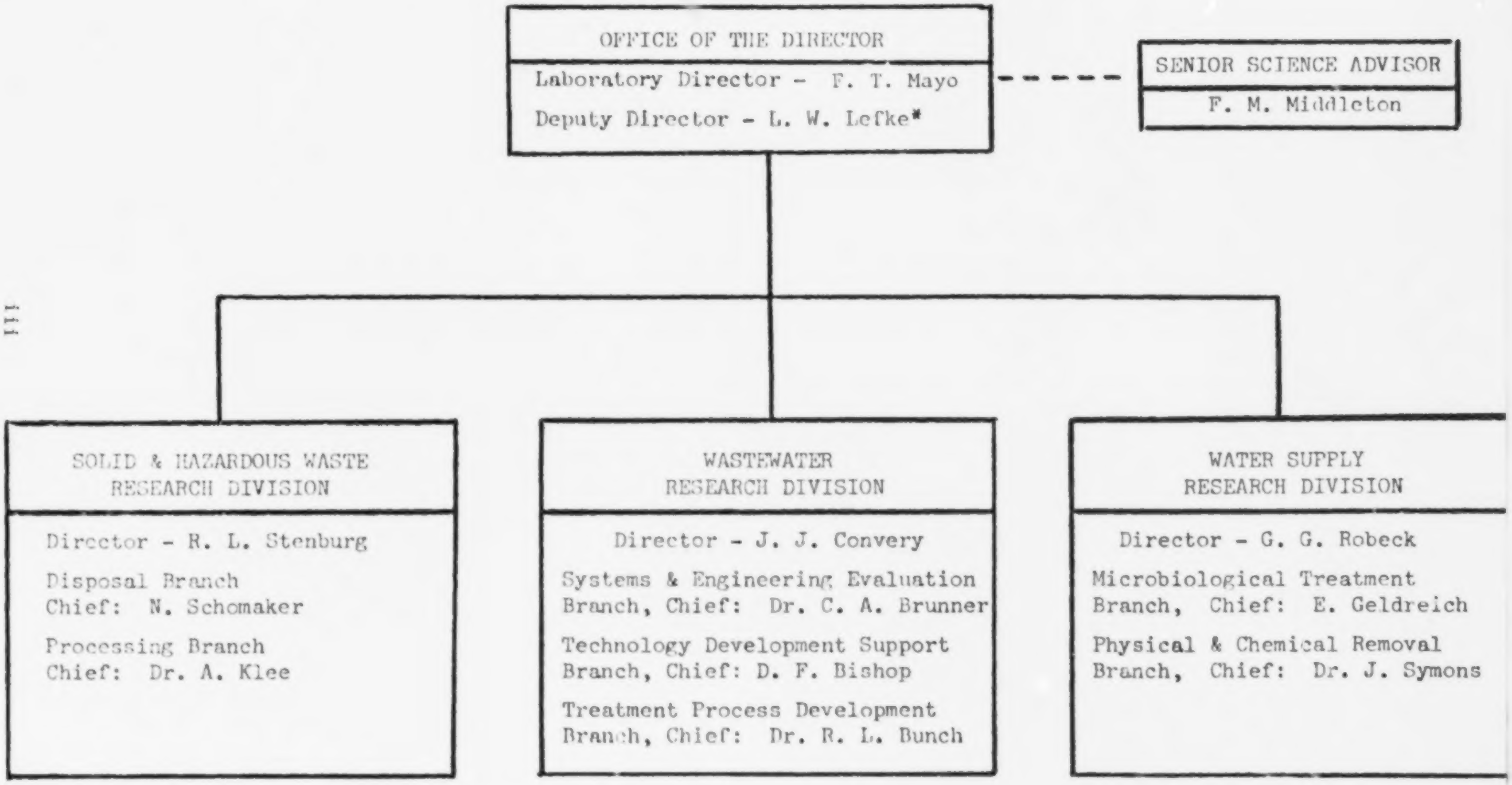
The Solid and Hazardous Waste Research Division develops and demonstrates new and improved technology and systems for solid and hazardous waste management. The SHWRD evaluates processing technology (including both collection and transportation) for either disposal or resource recovery, and socio-economic effects associated with these areas. Disposal technology, especially sanitary landfills, is also evaluated, together with related environmental and socio-economic effects. Hazardous wastes are a prime area of concern, and here the emphasis is on characterization of such materials, e.g., pesticides, organic substances, metals, as well as on their processing and disposal. The current legislative mandate of the SHWRD is the Resource Recovery Act of 1970.

This volume consists of single-page project descriptions of all the extramural MERL research tasks which were active in July, 1975. These descriptions are intended to convey a general idea of what our research is all about. However, specific questions which may arise should be directed to project officers or other MERL managers. An organizational chart listing Laboratory and Division Directors, and Branch and Section Chiefs, is presented here to facilitate such contacts.

Francis T. Mayo

MUNICIPAL ENVIRONMENTAL RESEARCH LABORATORY

Cincinnati, Ohio



OFFICE OF THE DIRECTOR

Laboratory Director - F. T. Mayo
Deputy Director - L. W. Lefke*

SENIOR SCIENCE ADVISOR

F. M. Middleton

SOLID & HAZARDOUS WASTE RESEARCH DIVISION

Director - R. L. Stenburg
Disposal Branch
Chief: N. Schomaker
Processing Branch
Chief: Dr. A. Klee

WASTEWATER RESEARCH DIVISION

Director - J. J. Convery
Systems & Engineering Evaluation Branch, Chief: Dr. C. A. Brunner
Technology Development Support Branch, Chief: D. F. Bishop
Treatment Process Development Branch, Chief: Dr. R. L. Bunch

WATER SUPPLY RESEARCH DIVISION

Director - G. G. Robeck
Microbiological Treatment Branch, Chief: E. Geldreich
Physical & Chemical Removal Branch, Chief: Dr. J. Symons

*Denotes Acting

Office of Air, Land and Water Use
Office of Research and Development
U. S. Environmental Protection Agency

MUNICIPAL ENVIRONMENTAL RESEARCH LABORATORY
ENVIRONMENTAL RESEARCH CENTER, ORD, EPA
26 W. St. Clair Street, Cincinnati, Ohio 45268

ORGANIZATION	TITLE	NAME	PHONE (A/C 513)
Office of the Director	Director	Mr. F. T. Mayo	684-7951
	Acting Deputy Director	Mr. L. W. Lefke	684-7953
	Senior Science Advisor	Mr. F. M. Middleton	684-7964
Solid & Hazardous Waste Research Division	Director	Mr. R. L. Stenburg	684-7861
Disposal Branch	Chief	Mr. N. Schomaker	684-7871
Processing Branch	Chief	Dr. A. Klee	684-7881
Wastewater Research Division	Director	Mr. J. Convery	684-7601
Systems & Eng. Evaluation Br.	Chief	Dr. C. Brunner	684-7609
Municipal Treatment Reuse Sec.	Chief	Mr. J. Smith	684-7611
Storm & Combined Sewer Sec.	Chief	Mr. R. Field	*
Technology Development Support Branch	Chief	Mr. D. Bishop	684-7628
Systems & Economic Analysis Section	Chief	Mr. R. Smith	684-7624
Waste Identification & Analysis Section	Chief	Mr. R. Williams	684-7626
Pilot & Field Evaluation Sec.	Chief	Dr. I. Kugelman	684-7631
Treatment Process Development Branch	Chief	Dr. R. Bunch	684-7655
Biological Treatment Section	Chief	Mr. E. Barth	684-7641
Physical-Chemical Treatment Section	Chief	Mr. J. Cohen	684-7671
Ultimate Disposal Section	Chief	Dr. J. Farrell	684-7645
Water Supply Research Division	Director	Mr. G. Robeck	684-7201
Microbiological Treatment Br.	Chief	Mr. E. Geldreich	684-7232
Physical & Chemical Removal Br.	Chief	Dr. J. Symons	684-7228
Distribution Quality Section	Chief	Mr. E. McFarren	684-7236
Economic Analysis Section	Chief	Mr. R. Clark	684-7209
Field Scale Organics Removal Section	Chief	Mr. J. DeMarco	684-7209
Inorganics Contaminants Sec.	Chief	Mr. T. Sorg	684-7228
Organic Investigations Sec.	Chief	Mr. A. Stevens	684-7228
Organic Removal Section	Chief	Dr. T. Love	684-7228
Particulate Contaminants Sec.	Chief	Dr. G. Logsdon	684-7228

*The Storm and Combined Sewer Section is located at Edison, New Jersey 08817, phone A/C 201 342-7503. All other personnel listed above are located at the Environmental Research Center adjoining the University of Cincinnati campus.

R. T. Bridges
2/76

PROJECT TITLE: Energy Conservation Through Reduction in Refuse

EXTRAMURAL PROJECT DIRECTOR:	**PROJECT NO.:** 804183 (Grant)
George W. Reid Bureau of Water & Environmental Resources Research 202 West Boyd Norman, Oklahoma 73069	**PROGRAM ELEMENT:** 1DA312 **ROAP:** 01ADC **EPA SUPPORT:** $13,500
MERL PROJECT OFFICER:	**BEGINNING DATE:** 9/1/75
Leo Weitzman Solid & Hazardous Waste Research Division, MERL	**COMPLETION DATE:** 8/31/77

PROJECT DESCRIPTION:

The energy that is expended to produce and deliver components of solid waste, and where, and how much, energy could be saved by a program of waste reduction will be studied. The possible avenues of waste reduction with the goal of reducing the per capita waste produced from the current U.S. average of 1400 lb./year to 480 to 650 lb./year produced per capita in European industrialized nations will also be studied. The study will also include the amount of potentially recoverable energy in the waste. No experimental work is planned. This is a library study.

PROJECT TITLE: Improving Labor Productivity in Solid Waste Management

EXTRAMURAL PROJECT DIRECTOR:

Dr. R. L. Shell, Associate Professor
University of Cincinnati
Cincinnati, Ohio 45221

MERL PROJECT OFFICER:

Oscar W. Albrecht
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: R801617 (Grant)
PROGRAM ELEMENT: 1DA312
ROAP: 01ADC

EPA SUPPORT: $123,957

BEGINNING DATE: 6/30/72

COMPLETION DATE: 6/29/75

PROJECT DESCRIPTION:

The purpose of this research is to determine the feasibility of a team wage incentive program for municipal solid waste collection and disposal personnel. Major research areas include identification of union - management - worker general attitudes and establishment of common goals for a wage incentive program; determination of the practicality of applying work measurement to collection and disposal job categories; and design of a prototype wage incentive program, assessing its impact on the total operating system. The City of Covington, Kentucky will serve as the model laboratory for the research study.

PROJECT TITLE: A Case Study of Hazardous Waste Input into a Class I Landfill

EXTRAMURAL PROJECT DIRECTOR:

Dr. Kenneth Y. Chen
Associate Professor
Environmental Engineering Programs
University of Southern California
Los Angeles, California 90007

MERL PROJECT OFFICER:

Richard Carnes
Solid & Hazardous Waste Research Division, MERL

PROJECT NO.: R803813 (Grant)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFO

EPA SUPPORT: $20,000

BEGINNING DATE: 8/1/75

COMPLETION DATE: 4/30/76

PROJECT DESCRIPTION:

The objective of this project is to document the type, amount, and characteristics (physical & chemical) of hazardous substances received by one of the largest Class I landfills in the Western United States.

Samples taken from each load brought to the site will be composited by industrial process and analyzed for trace elements such as Ag, As, Be, Cd, Cr, Cu, Fe, Hg, Ni, Pb, Se, V, and Zn. Composition of both the solid and the liquid phases will be determined as well as the oxidation states of major elements. In the final report the data will be categorized according to the general waste type (e.g., acids, alkalis, oily wastes, pesticide wastes, etc.) and according to the specific industrial process generating the waste.

PROJECT TITLE: Evaluation of Liner Materials Exposed to Hazardous and Toxic Sludges

EXTRAMURAL PROJECT DIRECTOR:

Dr. Henry E. Haxo
Matrecon, Incorporated
2811 Adeline Street
Oakland, California 94608

MERL PROJECT OFFICER:

Robert Landreth
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: 68-03-2173 (Contract)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFO

EPA SUPPORT: $115,968

BEGINNING DATE: 2/3/75

COMPLETION DATE: 8/2/77

PROJECT DESCRIPTION:

The objective of this project is to determine the effective lines of twelve pond liner materials exposed to a variety of nonradioactive industrial hazardous wastes.

The approach is to expose specimens of liners sealed at the bottom of individual test cells to six different hazardous wastes to determine seepage through liners and changes in physical properties over twenty-four months.

PROJECT TITLE: Evaluation of Liner Materials Exposed to Leachate

EXTRAMURAL PROJECT DIRECTOR:

Dr. Henry E. Haxo
Matrecon, Incorporated
2811 Adeline Street
Oakland, California 94608

MERL PROJECT OFFICER:

Robert Landreth
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: 68-03-2134 (Contract)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFO

EPA SUPPORT: $135,381

BEGINNING DATE: 8/21/74

COMPLETION DATE: 2/20/77

PROJECT DESCRIPTION:

The objective of this project is to evaluate the effective life and durability of 12 different liner materials exposed to prolonged contact with leachate generated from municipal refuse under conditions comparable to those encountered in a sanitary landfill. Both synthetic materials (e.g. polyvinylchloride, polyethylene, ethylene propylene rubber, butyl rubber, etc.) and admixed materials (e.g. asphaltic-concrete, bituminous seal coat, soil-bitumen, soil-cement, etc.) shall be investigated.

PROJECT TITLE: Field Verification of Industrial Hazardous Material Migration from Land Disposal Sites in Humid Regions

EXTRAMURAL PROJECT DIRECTOR:

James P. Gibbs
Illinois State Water Survey
University of Illinois
Urbana, Illinois 61801

MERL PROJECT OFFICER:

Michael Roulier
Solid & Hazardous Waste Research Laboratory, MERL

PROJECT NO.: R803216 (Grant)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFO

EPA SUPPORT: $170,000

BEGINNING DATE: 6/12/74

COMPLETION DATE: 7/21/76

PROJECT DESCRIPTION:

This project will evaluate the extent and magnitude of hazardous waste migration and resultant groundwater pollution from 3 known land disposal sites in Illinois. During the study special emphasis will be given to sites underlain by low-permeability clay and silt soils which have received large volumes of hazardous materials such as arsenic, cadmium, chromium, cyanide, lead, mercury, and pesticides. Methodology and technology from the fields of groundwater hydrology, geology, agronomy, chemistry, and geophysics will be employed in the work which will be supervised on a full-time basis by the principal investigator, a groundwater hydrologist assisted on a part-time basis by an associate geologist and a consultant agronomist. Chemical analyses of soil cores and groundwater samples will be the primary investigative tools used to quantitatively evaluate chemical migration from each of the 3 disposal sites. Data collection will be obtained primarily by contractual work from commercial soils and chemistry laboratories.

The findings of this study should provide an invaluable tool to employ in predicting possible ultimate adverse effects of land disposal of hazardous materials in time to permit perfection or development of technology required to insure future minimal danger to public health from this particular waste disposal practice. Also, the findings should be immediately applicable for use in evaluating the extent and magnitude of hazardous chemical migration from disposal sites situated in similar geohydrologic environments throughout Illinois and much of the other 15 glaciated, humid-region States in the country.

PROJECT TITLE: Investigation of Leachate Pollutant Attenuation in Soils

EXTRAMURAL PROJECT DIRECTOR:

Neil F. Shimp
Illinois State Geological Survey
Urbana, Illinois 61801

MERL PROJECT OFFICER:

Michael Roulier
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: 68-03-0211 (Contract)
PROGRAM ELEMENT: 1DB064
ROAP: 21BFO

EPA SUPPORT: $165,900

BEGINNING DATE: 6/21/74

COMPLETION DATE: 5/30/75

PROJECT DESCRIPTION:

The purpose of this contract is to obtain information about the influence of clay minerals, the most important chemically active components of subsoils, on the potential for migration through soil of the hazardous materials arsenic, beryllium, cadmium, chromium, copper, lead, mercury, selenium, and zinc. The migration and attenuation of these substances as they are moved into the soil by landfill leachate will be examined by work with laboratory soil columns and by single element adsorption isotherm studies. The information obtained will be used to evaluate criteria for sanitary landfill sites, particularly for those landfills which may receive wastes containing appreciable concentrations of the hazardous substances listed above.

PROJECT TITLE: Migration of Hazardous Substances Through the Soil

EXTRAMURAL PROJECT DIRECTOR:

Ronald E. Bell
Chief, Chemical Technology Branch
Chemical Laboratory Division
Dugway Proving Ground
Department of the Army
Dugway, Utah 84022

MERL PROJECT OFFICER:

Michael Roulier
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: IAG-D4-0443

PROGRAM ELEMENT: 1DB064

ROAP: 21BFO

EPA SUPPORT: $829,500

BEGINNING DATE: 3/12/74

COMPLETION DATE: 12/77

PROJECT DESCRIPTION:

The objectives of this project are to examine the extent to which hazardous substances from certain landfill industrial waste disposal sites could migrate into the ground or surface waters and to develop an empirical method for describing the potential for such migration. The project will be conducted in three phases. First, the industrial waste samples will be characterized physically and chemically. Then the effects of soil type and leaching solution on the migration rate of waste sample components through saturated anaerobic soil will be studied. Finally the mechanism of absorption of waste sample components from leachate into the soil will be studied. During the project, soil migration of forty-three industrial wastes, six flue gas desulfurization wastes, and three flyash samples will be studied.

PROJECT TITLE: Pesticide Migration and Degradation Rates in Soils Receiving High Chemical Concentrations

EXTRAMURAL PROJECT DIRECTOR:

James M. Davidson
2169 McCarty Hall
University of Florida
Gainesville, Florida 32611

MERL PROJECT OFFICER:

Michael Roulier
Solid & Hazardous Waste Research Division, MERL

PROJECT NO.: 803849 (Grant)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFO

EPA SUPPORT: $57,521

BEGINNING DATE: 7/15/75

COMPLETION DATE: 7/14/77

PROJECT DESCRIPTION:

The objectives of this grant proposal are to study migration and degradation rates in soils which have received high concentrations of pesticide and to use the resulting information to demonstrate the applicability of existing mathematical models in describing pesticide migration and degradation. Specific areas of study include: (a) adsorption-desorption as a function of the type of pesticide and the soil water regime; (b) degradation rates and identification of metabolites or intermediate products; (c) effect of pesticide concentration on microbial activity and microbial degradation; (d) effect of initial and imposed soil-water conditions on movement and distribution of pesticides.

PROJECT TITLE: Study to Evaluate Absorbents for Removal of Contaminants in Leachate During Disposal of Industrial Sludges

EXTRAMURAL PROJECT DIRECTOR:

Dr. John Liskowitz, Associate Professor
Environmental Engineering
Foundation at Newark College of Engrg.
323 High Street
Newark, New Jersey 07102

MERL PROJECT OFFICER:

Michael Roulier
Solid & Hazardous Waste Research Division, MERL

PROJECT NO.: R803717 (Grant)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFO

EPA SUPPORT: $25,000

BEGINNING DATE: 6/1/75

COMPLETION DATE: 1/1/76

PROJECT DESCRIPTION:

A laboratory investigation will examine the effectiveness of fly ash, bottom ash, Ottawa sand, activated carbon, illite, kaolinite, vermiculite, natural zeolites and activated alumina as absorbents for removing the hazardous and toxic materials in the leachate and liquid portion of the waste originating from petroleum refining sludge, metal finishing sludge and calcium fluoride sludge from the electronics and aircraft industries.

These results of this study will provide information and recommendations for the use of such absorbents in landfill operations for the safe disposal of hazardous and toxic sludges indicated above.

PROJECT TITLE: Use of Simulation for Characterizing Transport in Soils Adjacent to Land Disposal Sites

EXTRAMURAL PROJECT DIRECTOR:

Dr. George F. Pinder
Department of Civil Engineering
Engineering Quadrangle
Princeton, New Jersey 08540

MERL PROJECT OFFICER:

Michael Roulier
Solid & Hazardous Waste Research Division, MERL

PROJECT NO.: R803827 (Grant)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFO

EPA SUPPORT: $40,034

BEGINNING DATE: 8/1/75

COMPLETION DATE: 7/31/77

PROJECT DESCRIPTION:

An existing computer simulation model will be modified so that it can be used to characterize contaminant transport in soils around disposal sites. The model has been used, in a two-dimensional version, to study the movement of chromium in the groundwater on Long Island. This grant will provide for development of a three dimensional version and for the application of this simulation model to the problems of (1) determining the attenuation properties of field soils, (2) evaluating the effectiveness of control measures for halting the spread of contaminated groundwater, and (3) optimizing the location of sampling points for monitoring contaminant movement and for studying contaminant transport properties of field soils.

PROJECT TITLE: Utilization of Lime, Iron Oxides, and Flux Control in the Design of Disposal Site Liners to Minimize Pollution Migration

EXTRAMURAL PROJECT DIRECTOR:

Wallace H. Fuller
Professor & Biochemist
Soils, Water & Engineering
University of Arizona
Tucson, Arizona 85721

MERL PROJECT OFFICER:

Michael Roulier
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: 803988 (Grant)
PROGRAM ELEMENT: 1DB064
ROAP: 21BFO

EPA SUPPORT: $69,045

BEGINNING DATE: 6/12/75
COMPLETION DATE: 6/30/76

PROJECT DESCRIPTION:

The effectiveness of lime and hydrous oxide liners for controlling the migration rate in solution of selected trace elements (As, Be, Cd, Cr, Cu, Hg, Ni, Pb, Se, V, and Zn) at various flow rates through soils will be studied. It will be a laboratory scale study using columns of disturbed soil for screening of lime, hydrous oxide (Fe), and solution flux treatments identified in a previous study of soil attenuation of municipal landfill leachate pollutants.

A model will be developed which relates pollutant attenuation by landfill liners to easily measurable properties of the physical system.

PROJECT TITLE: Volatilization and Vapor Phase Transport of Hexachlorobenzene from Industrial Wastes Deposited on Land

EXTRAMURAL PROJECT DIRECTOR:

Walter J. Farmer, Associate Professor
of Soil Science
Department of Soil Science &
Agricultural Engineering
University of California
Riverside, California 92502

MERL PROJECT OFFICER:

Michael Roulier
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: 68-03-2014 (Contract)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFO

EPA SUPPORT: $57,417

BEGINNING DATE: 6/14/74

COMPLETION DATE: 6/13/76

PROJECT DESCRIPTION:

The objective of this project is to determine the effectiveness of coverings of soil, polyethylene sheeting and water in reducing the volatility of hexachlorobenzene from industrial wastes and to characterize those factors of the soil, environment and waste which influence the rate of volatility of hexachlorobenzene.

Landfill operations will be simulated in the laboratory under controlled environmental conditions. Using a closed air flow system with provisions for vapor-trapping, breakthrough curves and volatilization rates of hexachlorobenzene (HCB) from industrial wastes covered with soil, polyethylene film, or water will be measured. The soil coverings will be used alone and in conjunction with the polyethylene film. Industrial wastes from different sources and of different HCB concentrations will be used. Soil and environmental factors to be characterized include temperature, soil depth, and air filled porosity. Vapor phase sorption isotherms of HCB on soil will be determined. Diffusion coefficients of HCB in soil and other coverings will be determined and used to estimate the effectiveness of various landfill operations in controlling HCB loss in the vapor phase.

Hexachlorobenzene is a stable, persistent, water insoluble chemical with a reported vapor pressure intermediate to that of the organochlorine insecticides dieldrin and lindane. Hexachlorobenzene in addition to being a registered fungicide is present as a byproduct in the commercial production of certain chlorinated compounds. Landfill is one possible mode of disposal of the industrial wastes from these processes and it is essential to know the potential for movement and loss via the vapor phase as a function of the method of operation of potential landfill sites. Models have been developed and tested in the laboratory for soil and environmental facts affecting the vapor phase movement and volatilization of lindane-treated soils. These models are being applied to the movement and volatilization of HCB which is a non to weakly polar chemical expected to behave similar to lindane.

PROJECT TITLE: Preparation of a Field Manual Summarizing Research on High-Ash Papermill Sludges, Their Characteristics and Recommended Disposal Practices

EXTRAMURAL PROJECT DIRECTOR:

Richard Ledbetter
U.S. Army Engineer
Waterways Experiment Station
P. O. Box 631
Vicksburg, Mississippi 39180

MERL PROJECT OFFICER:

Robert Landreth
Solid & Hazardous Waste Research Division, MERL

PROJECT NO.: IAG-D5-F657

PROGRAM ELEMENT: 1DB064

ROAP: 21BFP

EPA SUPPORT: $20,000

BEGINNING DATE: 12/20/74

COMPLETION DATE: 12/20/75

PROJECT DESCRIPTION:

First, the U.S. Army Engineer Waterways Experiment Station will review the literature for information that will have an effect on a rational engineering approach to the optimum development of landill sites utilizing high ash papermill sludges or other similar media.

Then a field manual will be prepared containing the following sections: physical properties, drainage, consolidation and settlement, and strength and stability. The field manual will be oriented toward an individual of technical background, but with little or no exposure to the soil mechanics discipline and be presented in such a fashion to enable that individual, given suitable physical properties and characteristics of a sludge in question, to rationally approach a landfill operation to attain a given objective--be it a desirable rate of consolidation, drainage, or ultimate strength characteristic.

PROJECT TITLE: Research Symposium - Gas and Leachate from Landfills: Collection, Formation and Treatment

EXTRAMURAL PROJECT DIRECTOR:

Dr. A. Joel Kaplovsky
Rutgers, The State University
P. O. Box 231
New Brunswick, New JErsey 08903

MERL PROJECT OFFICER:

Robert Landreth
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: R803663 (Grant)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFP

EPA SUPPORT: $19,688

BEGINNING DATE: 2/3/75

COMPLETION DATE: 9/30/75

PROJECT DESCRIPTION:

The symposium will involve current ongoing research activities, government and private sponsored. The symposium will have at least the three following objectives: (a) to circulate, discuss and interrelate the new information being produced in the area of gas and leachate formation, collection and treatment; (b) to promote contact between research personnel from various parts of this and other countries in an atmosphere conducive to free and unrestrained discussion; and (c) to produce a report that will contain the presentations so that the State-of-the-Art review will be available to the scientific field.

The proceedings of the research symposium will be published.

PROJECT TITLE: Study of Vegetation Problems Associated with Refuse Landfills

EXTRAMURAL PROJECT DIRECTOR:

Ida A. Leone & Franklin Flowers
Associate Research Professor
Department of Plant Biology
Cook College, Rutgers University
New Brunswick, New Jersey 08903

MERL PROJECT OFFICER:

Robert Landreth
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: R803762 (Grant)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFP

EPA SUPPORT: $144,837

BEGINNING DATE: 5/15/75

COMPLETION DATE: 6/30/78

PROJECT DESCRIPTION:

The objectives of this study are: (A) To determine the extent of vegetation injury and death associated with operating and completed refuse landfills throughout the U.S. (B) Determine the factors which contribute to this vegetation injury or death. (C) Present recommendations as to how to protect vegetation existing adjacent to a refuse landfill. (D) Establish recommendations as to how to determine when and how to plant vegetation on and/or about a refuse landfill. (E) Establish recommendations as to what species of vegetation would be best suited to living on and about a refuse landfill.

The project will include field and laboratory investigations. The field investigations will involve both a mail survey of the continental U.S. and Puerto Rico to determine the extent of vegetation growth problems associated with refuse landfills. This will be followed by on-site inspection of selected sites in 7 of the 8 major U.S. meteorological regions. Measurements will be made of the soils, ground gases, and other environmental parameters at each of the field sites. The laboratory investigations will entail a study of the effects of landfill gases and growing conditions upon selected vegetation. Representative vegetation will also be planted at selected landfill sites and observed for growth responses during this study.

PROJECT TITLE: Analytical Services: Solid, Aqueous and Gaseous from a Sanitary Landfill

EXTRAMURAL PROJECT DIRECTOR:

Pete Barnet
Pedco Environmental Specialists, Inc.
Suite 13 - Atkinson Square
Cincinnati, Ohio 45246

MERL PROJECT OFFICER:

Dirk Brunner
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: 68-03-2028 (Contract)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFQ

EPA SUPPORT: $32,000

BEGINNING DATE: 11/1/75

COMPLETION DATE: 10/31/76

PROJECT DESCRIPTION:

The purpose of this contract is to provide selected analytical services for the Boone County Field Site solid waste landfill research projects. The services are to include physical and chemical analyses of aqueous, solid and gas samples.

PROJECT TITLE: Case Study of Los Angeles County Sanitation District Palos Verdes Landfill Gas Development Project

EXTRAMURAL PROJECT DIRECTOR:

Frank R. Bowerman
880 Kirkwood Lane
La Habra, California 90631

MERL PROJECT OFFICER:

Charles Rogers
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: 68-03-2143 (Contract)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFQ

EPA SUPPORT: $18,508

BEGINNING DATE: 10/25/74

COMPLETION DATE: 2/24/75

PROJECT DESCRIPTION:

The purpose of this contract is to develop a case study and prepare a report detailing the optimistic parameters for methane production and recovery with suggested modifications and recommendations of the Los Angeles County Sanitation Districts' Palos Verdes Landfill Gas Development Project.

PROJECT TITLE: Determination of the Effects of Compost on Selected Soils and Plants

EXTRAMURAL PROJECT DIRECTOR:

O. W. Kochtitzky
Chief Environmental Engineer
Tennessee Valley Authority
725 Edney Building
Chattanooga, Tennessee 37401

MERL PROJECT OFFICER:

Carlton Wiles
Solid & Hazardous Waste Research Division, MERL

PROJECT NO.: IAG-D4-0415
PROGRAM ELEMENT: 1DB064
ROAP: 21BFQ

EPA SUPPORT: $61,000

BEGINNING DATE: 9/17/74
COMPLETION DATE: 6/30/78

PROJECT DESCRIPTION:

The task objective is to obtain data to help determine short- and long-term effects of compost produced from municipal refuse on selected soils and plants. Emphasis is being directed at determining use benefit relationships and the fate of heavy metals and other potentially toxic materials when the compost is applied to selected soils and plants. There is a dearth of data relative to what happens to waste material containing potential toxic substances when disposed of on the land. There is also an interest in more fully utilizing the land as a disposal sink and processing medium for various wastes (e.g., municipal refuse, industrial sludges, sludge wastewater, etc.). Completion of this task will provide some of the data not available relative to the fate of potentially toxic substances contained in wastes disposed of on land.

PROJECT TITLE: Effect of Moisture Regimen on Solid Waste Stabilization

EXTRAMURAL PROJECT DIRECTOR:

E. S. K. Chian
Assistant Professor of Environmental Engineering
Dept. of Civil Engineering
University of Illinois
Urbana, Illinois 61801

MERL PROJECT OFFICER:

Dirk Brunner
Solid & Hazardous Waste Research Division, MERL

PROJECT NO.: R803652 (Grant)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFQ

EPA SUPPORT: $58,500

BEGINNING DATE: 5/1/75

COMPLETION DATE: 4/30/77

PROJECT DESCRIPTION:

The proposed research involves the measurement of gas production rates and leachate composition to measure refuse stabilization under anaerobic conditions. The refuse has different steady state and transient moisture conditions to simulate actual landfill conditions. Optimum moisture conditions will be determined for the acid and methane fermentation phase during the refuse stabilization. These conditions can then be selected by enforcement agencies to create the most desirable environmental impact of the solid waste on the environment.

PROJECT TITLE: An Evaluation of Cover Materials for Sanitary Landfills

EXTRAMURAL PROJECT DIRECTOR:

W. E. Nelson
Tuskegee Institute
George W. Carver Research Foundation
Tuskegee Institute, Alabama 36088

MERL PROJECT OFFICER:

Dirk Brunner
Solid & Hazardous Waste Research Division, MERL

PROJECT NO.: 802412 (Grant)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFQ

EPA SUPPORT: $148,965

BEGINNING DATE: 12/17/73

COMPLETION DATE: 1/15/77

PROJECT DESCRIPTION:

The major objective of this study is to determine the effects of various combinations of soil types and densities and vegetative cover on the net infiltration of rainwater of landfilled solid waste. A secondary objective is to study the effect of landfill gas on selected vegetative cover crops. The objectives of this 3-year project are to be met by use of field plots. Laboratory studies will augment the field studies. This is an MIRS project.

PROJECT TITLE: An Evaluation of Sanitary Landfill Gas & Leachate Production

EXTRAMURAL PROJECT DIRECTOR:

Melvin C. Eifert
Systems Technology Corporation
3131 Encrete Lane
Dayton, Ohio 45439

MERL PROJECT OFFICER:

Dirk Brunner
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: 68-03-2120 (Contract)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFQ

EPA SUPPORT: $301,000

BEGINNING DATE: 7/19/74

COMPLETION DATE: 6/28/77

PROJECT DESCRIPTION:

There are eight objectives to be met. Determine the effect of: 1) Varying moisture regimen on production of gas and leachate; 2) Temperature on gas and leachate production; 3) Wastewater treatment plant sludges on solid waste decomposition; 4) pH control on solid waste decomposition; 5) Premature wetting; 6) Hazardous liquid and sludge and their fate; 7) Determine the survival of polio virus; and 8) Determine the settlement rate in the lysimeters.

The approach consists of 17 lysimeters each containing three tons of raw compacted waste. These lysimeters are located at the EPA Center Hill Facility in Cincinnati, Ohio. Fifteen of these cells are outside of the building while two are inside the building at room temperature. There are two stages to the program. The first stage is preparation of the cells, characterization of the waste and placement of the waste into the cells along with the instrumentation. The second phase is monitoring the cells for gas composition and volume, leachate composition and volume, temperature, pressure, settlement, water applications and the application of polio viruses into one of the cells. Water application rate is according to average U.S. rainfall pattern. The study is to last for approximately three years.

The current plans are to load the lysimeters approximately four months after the start of the effort, and then to commence full-scale monitoring of the cells for the remainder of the effort. The data will be reduced on a continuing basis in order to obtain trend information.

PROJECT TITLE: Investigation of Leachate Pollutant Attenuation in Soils

EXTRAMURAL PROJECT DIRECTOR:	PROJECT NO.: 68-03-0208 (Contract)
Dr. Wallace Fuller University of Arizona Department of Soils, Water & Engineering Tucson, Arizona 85721	PROGRAM ELEMENT: 1DB064 ROAP: 21BFQ EPA SUPPORT: $137,337
MERL PROJECT OFFICER:	
Michael Roulier Solid & Hazardous Waste Research Division, MERL	BEGINNING DATE: 12/72 COMPLETION DATE: 6/75

PROJECT DESCRIPTION:

The migration of leachate from a landfill occurs through the surrounding soil. Soil can act as a filter for leachate contaminants. Therefore, the various attenuation mechanisms of soil need to be evaluated and related to leachate movement through the soils. This project will identify the attenuation mechanisms; evaluate pollutant attenuation of soils by column studies; develop simulation models for prediction of solute changes for water flow through soils. It is anticipated that empirical predictive equations relating to leachate pollutant attenuation in soils can be developed.

PROJECT TITLE: Prediction Model for Sanitary Landfill Gas Movement

EXTRAMURAL PROJECT DIRECTOR:

Dr. Charles A. Moore
Department of Civil Engineering
Ohio State University Research Foundation
1314 Kinnear Road
Columbus, Ohio 43212

MERL PROJECT OFFICER:

Dirk Brunner
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: 68-03-0326 (Contract)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFQ

EPA SUPPORT: $86,994

BEGINNING DATE: 6/29/73

COMPLETION DATE: 8/31/75

PROJECT DESCRIPTION:

The objective of this project is to develop a method utilizing specific site characteristics to predict the migration through soil of gases produced from sanitary landfilling of solid waste. This method will help to meet the need to rationally evaluate the potential environmental hazards associated with migrating gases.

The approach is to develop, from information available primarily in the field of gas flow through porous media, a comprehensive, three-dimensional model capable of predicting gas flow through nonisotropic, heterogeneous soils under transient and steady-state conditions. The predictive method is intended for routine use by design and regulatory engineers utilizing simulations generated from the comprehensive model. Thus, several typical sanitary landfills will each be simulated to allow easy solution by use of charts, nomographs, and/or simple equations sensitive to specific site characteristics.

Field verification of the model to be developed and comprehensive evaluation of gas production will need to be performed in addition to this project to allow rational evaluation of potential hazards associated with migrating gas from a specific landfill, either planned, in operation, or completed.

PROJECT TITLE: Quality & Quantity Gas & Leachate Generation from Processed & Non-Processed, Baled & Non-Baled Municipal Solid Waste

EXTRAMURAL PROJECT DIRECTOR:

Melvin C. Eifert
Systems Technology Corporation
3131 Encrete Lane
Dayton, Ohio 45439

MERL PROJECT OFFICER:

Richard Carnes
Solid & Hazardous Waste Research Division, MERL

PROJECT NO.: 68-03-2028 (Contract)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFQ

EPA SUPPORT: $181,000

BEGINNING DATE: 6/18/74

COMPLETION DATE: 6/17/77

PROJECT DESCRIPTION:

The objective of this contract is to determine the gas production rate, qualitatively and quantitatively, and to monitor the quality and quantity of any leachates produced during the course of the research. The gas generation and identification will eventually be incorporated into models predicting landfill gas migration. The rates of gas production and their specific contents are needed to properly outline and/or identify the hazards associated with landfill gas.

PROJECT TITLE: Treatment of Leachate Generated from Sanitary Landfills

EXTRAMURAL PROJECT DIRECTOR:

Edward S. K. Chian
Project Director
University of Illinois
Department of Civil Engineering
Urbana, Illinois 61801

MERL PROJECT OFFICER:

Dirk Brunner
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: 68-03-0162 (Contract)

PROGRAM ELEMENT: 1DB064

ROAP: 21BFQ

EPA SUPPORT: $172,100

BEGINNING DATE: 6/23/72

COMPLETION DATE: 8/31/75

PROJECT DESCRIPTION:

The treatment of leachate from many landfills in the United States is a practical necessity. Research presently underway is designed to give quick answers to the question of how to treat this liquid, since no lab, pilot, or field-scale data is available. A more detailed study is needed to determine process kinetics, the nature of the organic fraction of leachate, and the degree of treatment that may be obtainable using conventional wastewater treatment methods. In addition, other methods of removing pollutants from water are being studied because of small volumes and the vast range of contaminant concentrations and flow rates. This contract was awarded in June 1972 and results are not as yet available. The final report, due in September 1974, should provide the technical data needed to rationally design on-site leachate treatment schemes.

PROJECT TITLE: A Study for a Review and Assessment of the Emplacement of Hazardous Wastes in Subsurface Salt Deposits

EXTRAMURAL PROJECT DIRECTOR:

Louis R. Reeder and Associates
5200 South Yale
Tulsa, Oklahoma 74135

MERL PROJECT OFFICER:

Carlton Wiles
Solid & Hazardous Waste Research Division, MERL

PROJECT NO.: 68-03-2013 (Contract)

PROGRAM ELEMENT: 1DB311

ROAP: 21BFN

EPA SUPPORT: $81,592

BEGINNING DATE: 6/17/74

COMPLETION DATE: 5/17/75

PROJECT DESCRIPTION:

This study will primarily involve a review of research, development, demonstration projects and other activities concerning the injection of hazardous waste into deep-wells and an assessment of the capability of the technology to dispose of and manage the waste in a manner that precludes environmental degradation. The purpose is to provide EPA in written report form, and as of the most current point in time, a single source of available information concerning research and other activities in deep-well disposal of hazardous waste and assessments of its effects on the environment. The output is expected to provide EPA with a basis for determining the need for studies for developing an effective monitoring and control program for the injection of hazardous waste into deep-wells.

PROJECT TITLE: New Methods for Efficient Detoxification/Destruction of Hazardous Wastes

EXTRAMURAL PROJECT DIRECTOR:

Dr. L. J. Bailin
Lockheed Missiles & Space Company
3251 Hanover Street
Palo Alto, California 94304

PROJECT NO.: 68-03-2190 (Contract)

PROGRAM ELEMENT: 1DB311

ROAP: 21BFR

EPA SUPPORT: $108,070

MERL PROJECT OFFICER:

Donald Oberacker
Solid & Hazardous Waste Research
Division, MERL

BEGINNING DATE: 4/9/75

COMPLETION DATE: 4/8/76

PROJECT DESCRIPTION:

The process of microwave plasma decomposition of organic materials will be applied to the detoxification/destruction of hazardous organic wastes. The investigation will start with the LPARL (Lockheed Palo Alto Research Laboratory) laboratory-size microwave plasma system. Following this, utilizing the information gained, i.e., reaction efficiency and reaction product identification, the detoxification process will be expanded from laboratory dimensions to a larger scale, continuous system employing custom designed, commercially available hardware.

A primary objective of the program is to evaluate the effectiveness of the expanded-scale system using hazardous organic compounds and wastes of current interest. The reaction products will be identified to determine whether the products are innocuous or toxic, and whether there is the possibility for recycling of the carrier gases, and recovery of useful materials as by-products.

PROJECT TITLE: Assessment of Techniques for the Detoxification of Selected Hazardous Materials

EXTRAMURAL PROJECT DIRECTOR:

Dr. Bernard P. McNamara
Biomedical Laboratory
Department of the Army
Headquarters, Edgewood Arsenal
Aberdeen Proving Ground, Maryland 21010

MERL PROJECT OFFICER:

Charles Rogers
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: IAG D5-0429

PROGRAM ELEMENT: 1DB311

ROAP: 21BKV

EPA SUPPORT: $100,000

BEGINNING DATE: 1/1/74

COMPLETION DATE: 12/30/77

PROJECT DESCRIPTION:

Edgewood Arsenal will make an assessment of techniques for the detoxification of selected hazardous and toxic materials. This proposed study is to provide technical data needed to determine if hazardous and toxic materials can be detoxified and by-products recovered for reuse without being detrimental to the health and welfare of the public.

Edgewood Arsenal will specifically collect and analyze data and will conduct research where desirable to develop answers to questions on the environmental safety of (1) catalytic, (2) chemical, (3) biochemical degradation, and (4) other processes for the detoxification of hazardous materials.

PROJECT TITLE: Catalytic Conversion of Hazardous and Toxic Chemicals

EXTRAMURAL PROJECT DIRECTOR:

Alvin H. Weiss
Worcester Polytechnic Institute
Worcester, Massachusetts 01609

MERL PROJECT OFFICER:

Robert Landreth
Solid & Hazardous Waste Research Division, MERL

PROJECT NO.: R802857 (Grant)

PROGRAM ELEMENT: 1DB311

ROAP: 21BKV

EPA SUPPORT: $130,182

BEGINNING DATE: 1/1/74

COMPLETION DATE: 1/31/76

PROJECT DESCRIPTION:

It is proposed to develop catalytic techniques to detoxify noxious, hazardous, and toxic organic pesticides. One objective is to produce, where practical and economically feasible, a useful as well as harmless product. New catalytic techniques as well as those previously described will be studied, keeping in mind cost as well as effectiveness.

Laboratory studies, where indicated, will be conducted in both batch and continuous micro-scale catalysis equipment.

The ultimate goal is to generate a procedural manual that recommends and details catalytic techniques for detoxification.

PROJECT TITLE: Compilation of a Report Describing Processes Applied to Thermal Degradation of Select Pesticides and Other Organics

EXTRAMURAL PROJECT DIRECTOR:

Dr. Boyd T. Riley
690 Clinton Springs Avenue
Cincinnati, Ohio 45229

MERL PROJECT OFFICER:

Richard Carnes
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: None.

PROGRAM ELEMENT: 1DB311

ROAP: 21BKV

EPA SUPPORT: $6,300

BEGINNING DATE: 11/19/74

COMPLETION DATE: 6/30/75

PROJECT DESCRIPTION:

A report describing various unit processes that have been applied to thermal degradation of select pesticides and other organics will be compiled. Report shall detail operating conditions, time/temperature relationship when available, unit economics, pesticides and/or organic wastes investigated, and suggest best available technology applicable. Report will be used by OSWMP as guidance for their demonstration contract utilizing full scale incinerators for destruction of hazardous wastes which can include waste and/or excess pesticides.

PROJECT TITLE: Laboratory Evaluation of the Thermal Decomposition of Pesticides

EXTRAMURAL PROJECT DIRECTOR:

Donovan S. Duvall
University of Dayton
300 College Park Avenue
Dayton, Ohio 45469

MERL PROJECT OFFICER:

Richard Carnes
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: R803540 (Grant)

PROGRAM ELEMENT: 1DB311

ROAP: 21BKV

EPA SUPPORT: $100,000

BEGINNING DATE: 2/1/75

COMPLETION DATE: 7/31/76

PROJECT DESCRIPTION:

This research proposes to determine the combustion temperature and residence time required to effectively destroy pesticides. Thirty-four different pesticide compounds will be examined. Evolved gas analysis will play a major role in measuring degree of thermal decomposition.

Thermogravimetric analysis, supplemented by trapping and subsequent analysis of evolved products, will be utilized. Modified pyrolysis-gas chromatography will be used to accurately determine temperature, residence time, and completeness of thermal decomposition.

PROJECT TITLE: Literature Survey of Data on Soil Degradation of Select Pesticides

EXTRAMURAL PROJECT DIRECTOR:

James R. Sanborn
Illinois Natural History Survey
University of Illinois
Urbana, Illinois 61801

MERL PROJECT OFFICER:

Richard A. Carnes
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: R803591 (Grant)

PROGRAM ELEMENT: 1DB311

ROAP: 21BKV

EPA SUPPORT: $25,658

BEGINNING DATE: 2/14/75

COMPLETION DATE: 5/14/76

PROJECT DESCRIPTION:

A detailed search of literature on 38 select pesticides will be carried out to collect all data on their soil fate. Data gathered will give detailed descriptions of the degradative pathways, rates of degradation, leaching characteristics, toxicity of these pesticides and their primary metabolites to man and other wildlife. The collection of this data will allow problem areas to be identified and further research indicated where deemed essential to complete soil degradative pathways for certain pesticides.

PROJECT TITLE: Develop and Test a Particulate and Gas Sampling System for High Temperature - High Pressure Process Gas Streams

EXTRAMURAL PROJECT DIRECTOR:

F. E. Moreno
Aerotherm/Acurex Corporation
485 Clyde Avenue
Mountain View, California 94042

MERL PROJECT OFFICER:

John Burckle
Solid & Hazardous Waste Research Division, MERL

PROJECT NO.: 68-03-2163 (Contract)

PROGRAM ELEMENT: 1AB012

ROAP: 21BJT

EPA SUPPORT: $130,000

BEGINNING DATE: 1/9/75

COMPLETION DATE: 4/18/76

PROJECT DESCRIPTION:

The necessary design, fabrication, and testing of a sampling system, or systems, for interfacing with a process unit operating under the conditions of high temperature, high pressure, and both high temperature and high pressure in order to obtain the measurement of the suspended particulate for both total mass loading and mass size distribution in the range of from about 7 μm to 0.2 μm will be conducted.

The sampling system, or systems, shall have the following capabilities: (a) operation at temperatures up to 2000°F and pressures up to 100 atmospheres; (b) traversing; (c) incorporation of the EPA measurement principles; (d) portability and ease of handling and operation. The test phase shall be designed to fully demonstrate the capabilities and safety aspects of the sampling interface and the proper procedure for installation, use, and removal of the sampling interface.

PROJECT TITLE: Establish Feasibility and Design of Automatic Particle Size Distribution Analyzer for Source Emissions

EXTRAMURAL PROJECT DIRECTOR:

Arthur Engelman
GCA Corporation
Burlington Road
Bedford, Massachusetts 01730

MERL PROJECT OFFICER:

John Burckle
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: 68-03-2154 (Contract)

PROGRAM ELEMENT: 1AB012

ROAP: 21BJT

EPA SUPPORT: $95,000

BEGINNING DATE: 12/10/74

COMPLETION DATE: 3/9/76

PROJECT DESCRIPTION:

It is the purpose of this project to experimentally demonstrate the technical feasibility and derive construction designs for a particle size distribution instrument which performs inertial classification of an aerosol with real-time assay of each fraction. The instrument is to be designed for use for relative characterization of the inlet and outlet streams of a particulate control device for the purposes of ascertaining whether or not the control device collects preferentially in the range of from 3 to 0.2 μm and also to give an approximate value of the loading in each range so that an impactor may be applied for the accurate measurement without extensive trial and error runs.

PROJECT TITLE: Sampling Protocol to Minimize Effects of Source Variations on Test Results

EXTRAMURAL PROJECT DIRECTOR:	**PROJECT NO.:** 68-03-2155 (Contract)
Douglas W. Cooper GCA Corporation GCA/Technology Divisioon Burlington Road Bedford, Massachusetts 01730	**PROGRAM ELEMENT:** 1AB012 **ROAP:** 21BJT **EPA SUPPORT:** $80,000
MERL PROJECT OFFICER:	**BEGINNING DATE:** 12/10/74
John Burckle Solid & Hazardous Waste Research Division, MERL	**COMPLETION DATE:** 12/9/75

PROJECT DESCRIPTION:

It is the purpose of this project to devise and demonstrate a sampling protocol for the measurement of particulate matter, both total loading and size distribution of the fine range, to determine the efficiency of control devices for large-scale fossil fuel fired systems. GCA Corporation shall examine the sources of temporal variations, their effects upon control equipment performance measurements and hence upon the design and application of control equipment; develop a protocol for minimizing the effects of variations to an acceptable level; and assess the availability of particulate test equipment suitable for the protocol designed.

PROJECT TITLE: Air Emission Testing for St. Louis/Union Electric Project

EXTRAMURAL PROJECT DIRECTOR:

Dr. L. Shannon
Midwest Research Institute
425 Volker Boulevard
Kansas City, Missouri 64110

MERL PROJECT OFFICER:

Carlton Wiles
Solid & Hazardous Waste Research Division, MERL

PROJECT NO.: 68-01-1837 (Contract)

PROGRAM ELEMENT: 1DB314

ROAP: 21BFS

EPA SUPPORT: $309,300

BEGINNING DATE: 10/8/74

COMPLETION DATE: 12/75

PROJECT DESCRIPTION:

A solid waste coal combination is being used as fuel for a Union Electric generating unit in St. Louis. Air emission sampling and analyses are being conducted. The boiler's mass, composition and energy balances will also be determined. This project will determine how the use of solid waste as supplemental fuel affects air emissions in an industrial boiler.

PROJECT TITLE: Development of Prototype Portable System for Pyrolysis of Agricultural Wastes into Fuels and Other Products

EXTRAMURAL PROJECT DIRECTOR:

Dr. John W. Tatom
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332

MERL PROJECT OFFICER:

Donald Oberacker
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: R803430 (Grant)

PROGRAM ELEMENT: 1DB314

ROAP: 21BFS

EPA SUPPORT: $73,770

BEGINNING DATE: 3/75

COMPLETION DATE: 10/75

PROJECT DESCRIPTION:

The objectives of this research grant are to refine and develop the hardware and system design for a portable pyrolysis unit. This system is to convert various types of agricultural wastes into useful, saleable fuels, such as char, oil, and gas. Initially, wastes studied under this program are to be selected from such candidates as cotton gin trash, peanut hulls, and bagasse. Hardware of this general type has been under development by Georgia Tech for several years and the results have been very encouraging, based on laboratory, pilot, and near-full scale hardware tests. Although the system has already been scaled up to commercial size in an operating plant pyrolyzing wood waste, a few additional hardware refinements are indicated for processing harder to handle wastes such as those listed above. The study will include some fourteen or more instrumental test runs with complete data analysis.

PROJECT TITLE: Environmental Assessment of Future Disposal Practices of Hazardous Materials-Plastics

EXTRAMURAL PROJECT DIRECTOR:

Dale A. Vaughan
Senior Research Scientist
Battelle Memorial Institute
505 King Avenue
Columbus, Ohio 43201

MERL PROJECT OFFICER:

Donald Oberacker
Solid & Hazardous Waste Research Division, MERL

PROJECT NO.: R803111 (Grant)

PROGRAM ELEMENT: 1DB314

ROAP: 21BFS

EPA SUPPORT: $27,000

BEGINNING DATE: 3/17/75

COMPLETION DATE: 7/31/75

PROJECT DESCRIPTION:

The objective of this investigation is to assess future growth in the plastic industry and evaluate the environmental impact of plastic waste based upon potential developments in recycle and disposal technology.

The approach is based upon anticipated future production, market, life of products and development in recycle and solid waste disposal technology over specific periods of (5, 10 and 20 years) time.

PROJECT TITLE: Environmental Effect of Utilizing Solid Waste as a Supplementary Power-Plant Fuel

EXTRAMURAL PROJECT DIRECTOR:

Dale A. Vaughan
Materials Science Department
Battelle Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

PROJECT NO.: R804008 (Grant)

PROGRAM ELEMENT: 1DB314

ROAP: 21BFS

EPA SUPPORT: $120,000

MERL PROJECT OFFICER:

Donald Oberacker
Solid & Hazardous Waste Research
Division, MERL

BEGINNING DATE: 6/12/74

COMPLETION DATE: 6/11/76

PROJECT DESCRIPTION:

The objective of this project is to investigate the benefits to the environment resulting from the utilization of solid waste as a supplementary fuel in existing coal-fired power plants.

The approach is to evaluate the gaseous and particulate emission plus the corrosiveness of combustion products as a function of refuse-coal ratio and as a function of sulfur content of the coal. Experiments will be conducted in an operating power station through cooperation of the City of Columbus, Ohio.

Furnace and stack gas and particulate samples will be collected throughout the periods that corrosion probes are inserted at several locations in the heat-recovery passes. These probes will be examined for corrosion attack and deposit composition for various gas and metal temperatures to provide guidance in future utilization of solid waste as a supplementary fuel.

PROJECT TITLE: Enzymatic Hydrolysis of Waste Cellulose to Produce Glucose

EXTRAMURAL PROJECT DIRECTOR:

Leo A. Spano
Department of the Army
U.S. Natick Laboratories
Natick, Massachusetts 01760

MERL PROJECT OFFICER:

Charles Rogers
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: IAG-D5-0758

PROGRAM ELEMENT: 1DB314

ROAP: 21BFS

EPA SUPPORT: $100,000

BEGINNING DATE: 4/15/75

COMPLETION DATE: 4/15/77

PROJECT DESCRIPTION:

The U.S. Army Natick Laboratory will conduct studies on (1) enzyme production, (2) substrate conditioning, (3) saccharification, (4) fermentation process development, (5) saccharification reactions, (6) the process control system, and will determine if an economically viable process for enzymatic conversion of cellulose to glucose can be developed.

PROJECT TITLE: Evaluation of Fine Grinding Requirements in Resource Recovery

EXTRAMURAL PROJECT DIRECTOR:

Professor George J. Trezek
University of California
Campus Research Office
M-11 Wheeler Hall
Berkeley, California 94720

MERL PROJECT OFFICER:

Carlton Wiles
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: R804034 (Grant)

PROGRAM ELEMENT: 1DB314

ROAP: 21BFS

EPA SUPPORT: $175,000

BEGINNING DATE: 7/31/75

COMPLETION DATE: 6/30/77

PROJECT DESCRIPTION:

This research involves a study of the theoretical and practical aspects of fine grinding of refuse. Current information on refuse size reduction primarily concerns larger particle sizes. This research will extend that data to smaller particle size ranges. Experiments will also be conducted to compare various grinders with respect to their capabilities for producing fine particles of refuse.

PROJECT TITLE: Feasibility Study of Utilizing Solid Waste for Building Materials

EXTRAMURAL PROJECT DIRECTOR:

Bud Duft
Material Systems Corporation
751 Citracado Parkway
Escondido, California

MERL PROJECT OFFICER:

Robert Landreth
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: 68-03-2056 (Contract)

PROGRAM ELEMENT: 1DB314

ROAP: 21BFS

EPA SUPPORT: $188,504

BEGINNING DATE: 6/20/74

COMPLETION DATE: 6/30/76

PROJECT DESCRIPTION:

The purpose of this project is to constructively evaluate and analyze previous research on potential products from waste materials. To determine the technical feasibility of products from selected waste materials. To determine the economics/cost effectiveness of utilizing waste materials for building products. To develop data on the supply and location of waste materials. To qualify selected waste material products under existing building codes. To demonstrate the feasibility, applicability, and acceptance of building products fabricated from waste materials.

PROJECT TITLE: Foam Glass Insulation from Waste Glass

EXTRAMURAL PROJECT DIRECTOR:

R. Thayne Robson
Research Professor of Economics
University of Utah
Salt Lake City, Utah 84112

MERL PROJECT OFFICER:

Charles Rogers
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: R800937

PROGRAM ELEMENT: 1DB314

ROAP: 21BFS

EPA SUPPORT: $40,000

BEGINNING DATE: 9/1/74

COMPLETION DATE: 8/31/75

PROJECT DESCRIPTION:

The feasibility of manufacturing foam glass insulation from waste glass will be carefully investigated. Foam board, pellets, and spheralikes can be made from waste glass with the aid of one of a number of foaming agents such as calcium carbonate, water, and certain carbonaceous materials. The parameters that govern optimum foaming conditions will continue to be defined. Properties of foams produced with the various foaming agents will be measured. The market potential for foam glass products and cost of manufacture will be estimated in order to the value of utilizing waste glass available from municipal waste.

PROJECT TITLE: Forecast Quantities and Material Composition of Future Household Solid Waste 1973-85

EXTRAMURAL PROJECT DIRECTOR:

Dr. Robert U. Ayres
International Research & Technology Corporation
1225 Connecticut Avenue, NW
Washington, DC 20036

MERL PROJECT OFFICER:

Ronald Talley
Solid & Hazardous Waste Research Division, MERL

PROJECT NO.: 68-03-0261 (Contract)

PROGRAM ELEMENT: 1DB314

ROAP: 21BFS

EPA SUPPORT: $65,073

BEGINNING DATE: 5/10/73

COMPLETION DATE: 6/10/75

PROJECT DESCRIPTION:

The objective of this research is to forecast the solid wastes generated by U. S. households from now through 1985. Emphasis will be on forecasts of the residuals from consumer purchases of food, publications, entertainment materials, and clothing. Other appropriate candidate for inclusion into the household solid waste flow are household appliances which are ultimately discarded, such as electric irons, television sets, and toasters. Other consumer purchases, such as automobiles, large appliances and furnaces, may be more appropriately treated as specialized waste flows rather than household waste flows as they are typically disposed of by the vendor replacing them. The results of this research will make it possible to increase the effectiveness of future disposal and resource recovery technologies and incentive strategies, which are largely dependent upon the composition of the waste stream to which they are applied.

Available consumer spending forecasts will be reviewed, identifying those products that may be expected to have waste management consequences. The results of these forecasts will be used to identify the economic sectors which produce these goods purchased by consumers. Input-output models will be used to identify the inter-sectorial relationships associated with each purchased good. Then with respect to these sectors and the goods produced and consumed, substitution analysis will be conducted to determine when one raw material will substitute for another (e.g., synthetic for natural fibers) or one produce will substitute for another (e.g., pre-packaged and precooked food for raw or unprepared food). The substitution analyses will account for changes in technology, cost and product mix.

PROJECT TITLE: Investigate and Develop a Process for the Production of Methanol as a Fuel

EXTRAMURAL PROJECT DIRECTOR:	PROJECT NO.: IAG D5-0646
Dr. Mark Antal Los Alamos Scientific Laboratory Atomic Energy Commission Los Alamos, New Mexico	PROGRAM ELEMENT: 1DB314 ROAP: 21BFS EPA SUPPORT: $127,000
MERL PROJECT OFFICER:	BEGINNING DATE: 1/31/75
Dr. Albert Klee Solid & Hazardous Waste Research Division, MERL	COMPLETION DATE: 1/31/76

PROJECT DESCRIPTION:

The research project will generate technical data needed to facilitate the production of hydrogen under less rigorous and more economical conditions. The hydrogen will be used in reactions to produce methanol from char resulting from the pyrolysis of solid wastes.

Los Alamos will specifically conduct studies to (1) discover and evaluate catalysts for the production of hydrogen and carbon monoxide at lower temperatures, (2) perform a system study of selected process reactions in order to evaluate its economic feasibility, (3) conduct bench-scale demonstration of those aspects of the process which shows promise in the production of methanol.

PROJECT TITLE: Investigation to Utilize Organic Residues to Improve Sludge Dewatering Characteristics and to Produce Usable Fuels

EXTRAMURAL PROJECT DIRECTOR:

Thomas J. Wittman
Systems Technology Corporation
3131 Encrete Lane
Dayton, Ohio 45439

MERL PROJECT OFFICER:

Carlton Wiles
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: 68-03-2105 (Contract)

PROGRAM ELEMENT: 1DB314

ROAP: 21BFS

EPA SUPPORT: $17,117

BEGINNING DATE: 6/28/74

COMPLETION DATE: 8/28/75

PROJECT DESCRIPTION:

The work to be performed in this program shall consist of bench and pilot scale testing to define the process, the economics, and the feasibility of using a mixture of sewage sludge and the organic rejects from material recovery operations using the Franklin, Ohio system to improve the dewatering characteristics of the sludge. The resulting dewatered sludge will be investigated to determine if it can produce methane and/or a solid fuel. To develop this waste, objectives must be met in each of these categories, i.e., process, economics, and feasibility.

PROJECT TITLE: Novel Pretreatments for Waste Cellulose Hydrolysis for Utilization of Cellulose Values from Solid Municipal Waste

EXTRAMURAL PROJECT DIRECTOR:

Walter Brenner
New York University
Division of Applied Science
Graduate School of Arts & Sciences
26-36 Stuyvesant Street
New York, New York 10003

MERL PROJECT OFFICER:

Charles Rogers
Solid & Hazardous Waste Research Division, MERL

PROJECT NO.: R803664 (Grant)

PROGRAM ELEMENT: 1DB314

ROAP: 21BFS

EPA SUPPORT: $45,828

BEGINNING DATE: 5/15/75

COMPLETION DATE: 5/14/76

PROJECT DESCRIPTION:

The objective of this grant proposal is to develop/optimize a novel acid hydrolysis process for the conversion of waste cellulose into glucose. Under Phase I, a study would be conducted to develop and optimize physical and chemical pretreatments for waste cellulose which would be technically and economically superior to present practices for maximizing the glucose yields. Phase II which is to be conducted concurrently with Phase I will concentrate on development and optimization of a novel acid hydrolysis process which is based on exposing an acid treated waste cellulose at ambient temperature to optimal acid hydrolysis temperature by contact with superheated water or steam.

This basic research program could lead to development of a viable acid hydrolysis system for production of glucose and its subsequent use as a feedstock for the production of ethyl alcohol.

PROJECT TITLE: Resource Recovery Study of the County of Hawaii

EXTRAMURAL PROJECT DIRECTOR:

Edward Harada
Chief Engineer
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

MERL PROJECT OFFICER:

Dr. Albert Klee
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: 803924 (Grant)

PROGRAM ELEMENT: 1DB314

ROAP: 21BFS

EPA SUPPORT: $50,000

BEGINNING DATE: Pending

COMPLETION DATE: 7/29/76

PROJECT DESCRIPTION:

The objective of the proposed project is to carry out a feasibility study to evaluate various alternatives for the disposal of the County of Hawaii's municipal solid waste. Particular emphasis is given to the possibility of producing electricity through the burning of refuse with bagasse in existing boilers owned by several local sugar companies. The work plan includes: surveys of existing solid waste collection, transfer, and disposal facilities; determination of present and future waste quantities and compositions; identification of available equipment and sites for waste pre-processing; evaluation of methods for handling the combustible fraction at the boilers; and recommendations for a specific course of action for the County to take.

PROJECT TITLE: Size Reduction in Solid Wastes Processing

EXTRAMURAL PROJECT DIRECTOR:

George Trezek
University of California
School of Engineering
Berkeley, California 94720

MERL PROJECT OFFICER:

PROJECT NO.: 801218 (Grant)

PROGRAM ELEMENT: 1DB314

ROAP: 21BFS

EPA SUPPORT: $100,000

BEGINNING DATE: 6/3/74

COMPLETION DATE: 6/29/75

PROJECT DESCRIPTION:

A refuse size-reduction laboratory has been developed so that the systematic study, via controlled experiments, of the parameters governing the comminution of size reduction of the heterogeneous mixture called municipal refuse can be performed. This laboratory contains a 10 ton/hr. hammermill which has been converte into a research tool. Hopefully, these studies will enhance the understanding of the mechanisms involved in the size-reduction of refuse. Adaptability of previous analytical comminution theories to refuse are being considered so that computation can be made for size distribution and power requirements. Fundamental data on size distribution of ground refuse and compression and tensile strength of various refuse components as well as complete packer truck and ground refuse is being measured. Energy requirements for various degrees of aluminum can shredding have also been measured by means of controlled laboratory experiments. These experimental data are vital to the establishment of the emerging technology of refuse comminution. They also form an integral basis of a concept and plan for the development of an apparatus, specifically for refuse size reduction.

PROJECT TITLE: Study of Solid Waste as a Supplementary Fuel in Industrial Boilers

EXTRAMURAL PROJECT DIRECTOR:

Lazaros J. Lazaridis
Thermo Electron Corporation
85 First Avenue
Waltham, Massachusetts

MERL PROJECT OFFICER:

Donald Oberacker
Solid and Hazardous Waste Research Division, MERL

PROJECT NO.: 68-03-0355 (Contract)

PROGRAM ELEMENT: 1DB314

ROAP: 21BFS

EPA SUPPORT: $78,091

BEGINNING DATE: 11/9/73

COMPLETION DATE: 2/8/75

PROJECT DESCRIPTION:

The utilization of municipal solid waste as a supplementary fuel for boilers in use at industrial establishments was investigated. A survey of the industrial sites, different boiler designs determined their potential for burning solid refuse as part of the fuel. Included in this survey was an assessment of modifications necessary to the boilers, operational problems expected from using solid waste as part of the fuel, the form the solid waste must be in, and a projection as to the expected effectiveness of each system. Several industrial boilers were selected for field testing.

A final report is in preparation.

PROJECT TITLE: Determine the Leachate Characteristics of Fixed Sludges

EXTRAMURAL PROJECT DIRECTOR:

Andrew J. Greene
Waterways Experiment Station
Corps of Engineers, U.S. Army
P. O. Box 631
Vicksburg, Mississippi 39180

MERL PROJECT OFFICER:

Robert Landreth
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: IAG-D4-0569

PROGRAM ELEMENT: 1AB013

ROAP: 21BLH

EPA SUPPORT: $1,340,000

BEGINNING DATE: 6/30/74

COMPLETION DATE: 6/30/80

PROJECT DESCRIPTION:

In the first phase of this project all existing chemical stabilization techniques for industrial and flue gas cleaning sludges will be surveyed and selected processes will be evaluated througn laboratory studies. This will be accomplished by meeting the following objectives:

(a) Compilation of a list of fixation techniques currently available.

(b) Development and employment of a procedure to screen candidate fixation processes.

(c) Comprehensive laboratory and field evaluation of a selected number of fixation processes that successfully survive the screening process.

The second phase of this project will evaluate municipal, industrial, and flue gas cleaning waste, disposal sites as they exist in the field. At least three (3) municipal sanitary landfill sites, four (4) industrial sites, without organics/pesticides, one (1) industrial site with organics/pesticides, and five (5) flue gas cleaning waste sites for a total of thirteen (13) sites, will be evaluated. The evaluation of these sites is considered as an acceleration of the existing program. The existing program will still have a field evaluation phase, but will have guidance from the results of this task.

PROJECT TITLE: Sludge Liner/Leachate Compatibility Investigation

EXTRAMURAL PROJECT DIRECTOR:

Z. B. Fry, Special Assistant
Soils & Pavements Laboratory
U.S. Army Engineer Waterways
Experiment Station
P.O. Box 631
Vicksburg, Mississippi 39180

MERL PROJECT OFFICER:

Robert Landreth
Solid & Hazardous Waste Research
Division, MERL

PROJECT NO.: IAG-D5-0785

PROGRAM ELEMENT: 1AB013

ROAP: 21BLH

EPA SUPPORT: $100,000

BEGINNING DATE: 6/4/75

COMPLETION DATE: 5/1/78

PROJECT DESCRIPTION:

The objectives of this project are to determine the compatibility of 18 liner materials with flue gas cleaning (FGC) waste and associated liquors and leachates; to estimate the length of life for the liners, and to assess the economics involved with purchase and placement (to include construction) of various liner materials.

Ten chemicals that are admixed into the soil, two flexible liners, and six spray-on type chemicals will be selected following a review of the literature considering the material to be contained and the related economic considerations of material cost, placement rate, and associated construction costs. These liner materials will be placed in exposure cells designed to simulate a depth of sludge/liquor of at least 20 ft. The depth will be increased in suitable time increments. The liners will be exposed for 12- and 24-month periods and subjected to tests to determine the characteristics of each type.

PROJECT TITLE: Assessment of Sewer Flow Measurement Devices/Techniques

EXTRAMURAL PROJECT DIRECTOR:

Philip E. Shelley, Director of Engineering
Hydrospace-Challenger, Inc.
2150 Fields Road
Rockville, Maryland

PROJECT NO.: 68-03-0426 (Contract)
PROGRAM ELEMENT: 1BB034
ROAP: 21ASY

EPA SUPPORT: $44,590

MERL PROJECT OFFICER:

David J. Cesareo

BEGINNING DATE: 3/28/74

COMPLETION DATE:

PROJECT DESCRIPTION:

Objectives: To develop the state-of-the-art of existing flow measurement devices and techniques; to identify, evaluate, and assess those devices/techniques applicable to wet-weather flow measurement; to identify, evaluate and assess new and promising devices/techniques specific to wet weather flow measurement; and to recommend future areas for research and development.

Approach: Among the flow measuring devices/techniques to be investigated are those employing open channel direct discharge methods, pressure flow direct discharge methods, velocity area methods, etc. The main emphasis will be on those suitable for unsteady flow conditions in urban drainage conduits. Only the limitations of conventional devices will be discussed, stating conditions where they can be applied to storm flow. Each flow measuring device/technique will be evaluated in so far as possible with respect to 23 predetermined operational parameters. User experience, especially from on-going USEPA projects, will be included as well as information and data from various manufacturers and vendors. Activities of other Federal Agencies, such as the Bureau of Reclamation, U.S. Geological Survey, and Department of Agriculture, will also be consulted for relevant information. The project will conclude with the publication of a state-of-the-art report that should be useful to anyone with a wet-weather flow measurement problem.

PROJECT TITLE: Baker Street Dissolved Air Flotation Facility

EXTRAMURAL PROJECT DIRECTOR:

City and County of San Francisco
Public Works Department
San Francisco, California 94102

MERL PROJECT OFFICER:

D. Cesareo
Wastewater Research Division

PROJECT NO.: 802701 (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $921,000

BEGINNING DATE: 7/24/69

COMPLETION DATE: 7/1/75

PROJECT DESCRIPTION:

The project consists of the design construction and evaluation of a combined sewer overflow treatment facility at the Baker Street outfall consisting of trash racks, sedimentation, dissolved air flotation and chlorination.

Conditions of the receiving waters will be investigated prior to placing facility in operation and cost effectiveness of the facility will be evaluated following construction.

The character of combined sewage tributary to the outfall will be defined and the applicability of the treatment process to other outfalls in the San Francisco system assessed.

PROJECT TITLE: **Boston University Bridge Storm Water Detention and Chlorination Station**

EXTRAMURAL PROJECT DIRECTOR:

Martin Weiss
Metropolitan District Commission
20 Somerset Street
Boston, Massachusetts

PROJECT NO.: 11023 FAT (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $1,000,000

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

BEGINNING DATE: 9/2/66

COMPLETION DATE: 3/76

PROJECT DESCRIPTION:

The objectives of this project are to construct a detention basin to intercept peak flows and to chlorinate wastewater, as a means of reducing combined sewage overflows into the Charles River. This project includes the construction and evaluation of a combined sewer overflow facility, designed to provide a ten-minute minimum sedimentation-detention time with an influent of 233 MGD. The chlorinated effluent will flow by gravity from the detention tanks through a 96-inch outfall pipe into the Charles River. Sludge deposits in the detention tanks will be returned to the sewer system to be treated at the sewage treatment plant. All settled materials will be flushed out of the tanks and into the sewer system after the storm subsides.

Final report under review.

PROJECT TITLE: Characterization and Disposal of Combined and Solids Sewer Overflow Sludges

EXTRAMURAL PROJECT DIRECTOR:

Anthony Geinopolos, Managing Associate
Environmental Sciences Div., Envirex Inc.
P. O. Box 2022
Milwaukee, Wisconsin 53201

MERL PROJECT OFFICER:

A. N. Tafuri
Wastewater Research Division

PROJECT NO.: 68-03-0242 (Contract)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $246,167

BEGINNING DATE: 6/29/73

COMPLETION DATE: 9/30/76

PROJECT DESCRIPTION:

The objectives of Phase I are to: (1) characterize the residual sludges arising from the treatment (physical, physical-chemical, and bio-chemical) of combined sewer overflows; and (2) develop promising alternative sludge handling/disposal treatment process flow sheets and an engineering evaluation of the alternative flow sheets developed.

The objectives of Phase II are to: (1) evaluate on pilot-scale the effectiveness of thickening-certrifugation treatment system for CSO residual sludges and on a bench-scale the effectiveness of anaerobic digestion of appropriate sludges; (2) develop basic design criteria and operating characteristics of the thickening-centrifucation dewatering system in a form that can be translated into actual practice with minimum delay; (3) develop capital and operating costs for the demonstrated treatment system; (4) evaluate, on a nationwide basis, the extent of the wet-weather flow sludge problem with respect to quantities generated, characteristics, and facility and cost requirements for handling and disposal; (5) evaluate the "shock-load" effect of CSO treatment residuals on dry-weather treatment plant operation and performance; (6) evaluate alternative methods for ultimate disposal of raw CSO sludges and treated CSO sludges.

PROJECT TITLE: **Combined Sewer Fluidic Regulator Demonstration**

EXTRAMURAL PROJECT DIRECTOR:

Carmen F. Guarino
Philadelphia Water Department
City of Philadelphia
1160 Municipal Services Building
Philadelphia, Pennsylvania 19107

MERL PROJECT OFFICER:

Richard Field
Wastewater Research Division

PROJECT NO.: 11022 FWR (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $77,410

BEGINNING DATE: 9/70

COMPLETION DATE: 8/76

PROJECT DESCRIPTION:

This project would utilize the design rationale developed under FWQA Program No. 11024 DGZ, (Contract 14-12-486) in the design, construction and operation of a full-size combined sewer fluidic regulator installed in two typical locations in the Philadelphia sewer system.

The specific objectives of the project are the following:

1. Design, construction and operation of a fluidic regulator for a flow range below 2 CFS with a minimum of reconstruction. The unit will be capable of demonstrating fluidic action on demand by use of city water to simulate storm flow and a transparent top for observation.
2. Design, construction, and operation of a fluidic regulator for a 4 CFS peak dry weather flow. This will demonstrate the use of a fluidic device at higher flows on combined sewerage. The automatic control of the overflow will be done by sensing the interceptor level. No overflow will occur until the interceptor reaches a pre-determined limit.
3. Evaluate the operation of above fluidic devices over a years' period, and relate their performance, both advantages and disadvantages to conventional regulator throughout the Philadelphia sewer system.
4. Assembly of all data from the evaluation and testing program including rainfall data, overflow vs. sensor height, so that the application of fluidics to sewer design can be demonstrated on a full-scale basis.

PROJECT TITLE: Combined Sewer Overflow Abatement Program - Rochester, New York

EXTRAMURAL PROJECT DIRECTOR:	PROJECT NO.: Y005141 (Contract)
J. MacDonald Rochester Pure Waters District 65 Broad Street Rochester, New York 14614	PROGRAM ELEMENT: 1BB034 ROAP: 21ASY EPA SUPPORT: $638,900
MERL PROJECT OFFICER:	BEGINNING DATE: 5/1/74
A. N. Tafuri Wastewater Research Division	COMPLETION DATE: 5/1/76

PROJECT DESCRIPTION:

The project entails a total systems approach to develop techniques for abating pollution from the municipal sector by considering wet and dry-weather wastewater collection, transport and treatment as one integrated system. The program will begin with basic aspects of system monitoring and conclude with a master plan for implementation based on the best available stormwater pollution control technology. This will involve use of the EPA Storm Water Management Model for system optimization; and treatment optimization by flexible pilot testing. The project will result in an effective demonstration of a city-wide approach to Storm & Combined Sewer Overflow Control and be a guide to other municipalities.

PROJECT TITLE: The Construction and Technical Evaluation of the Various Aspects of an Aluminum Storm Sewer System

EXTRAMURAL PROJECT DIRECTOR:

James J. Giordano
City of LaSalle
LaSalle, Illinois

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

PROJECT NO.: 11032 DTI (Grant)
PROGRAM ELEMENT: 1BB034
ROAP: 21ASY

EPA SUPPORT: $432,276

BEGINNING DATE: 6/23/69
COMPLETION DATE: 5/15/76

PROJECT DESCRIPTION:

The objective of this project is to demonstrate the correction of combined sewer overflow problems by constructing a separate storm drainage system for a portion of the city. Engineering study indicates that this is the most economical solution for the city. The development and demonstration aspects will be:

1) installation and evaluation of performance, durability, and dependability of various size corrugated aluminum pipe;
2) prototype development and evaluation of improved joint couplers, tapping saddles, catch basins and manholes;
3) a detailed cost analysis to allow comparison of aluminum pipe with a commonly used sewer material; and
4) a construction practice evaluation for future installation guidance.

PROJECT TITLE: A Continuous On Line Monitoring System for Organics in Storm and Combined Sewers

EXTRAMURAL PROJECT DIRECTOR:

Raytheon
P. O. Box 360
Portsmouth, Rhode Island 02871

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

PROJECT NO.: 68-03-0262 (Contract)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT:

BEGINNING DATE:

COMPLETION DATE:

PROJECT DESCRIPTION:

Early in the program a stormwater total organic carbon (TOC) system, was developed. Hardware was assembled that would process stormwater samples containing high suspended solids and that would obtain a continuous signal proportional to the concentration of TOC in the sample.

Synthetic samples of municipal raw influent charged with primary sludge were analyzed using the TOC analyzer. Data were also obtained on actual stormwater samples collected during storm events at Boston. Further modifications were made after these observations.

Automatic circuitry designed to provide turn on, auto-zero, auto-span, and sample line flushing was added to the hardware, and the system was installed at Boston Cottage Farm Storage Facility.

Automatic continuous analyses were obtained during storms on site at the Cottage Farm Storage Facility.

PROJECT TITLE: Demonstration/Evaluation of Impregnated Concrete Pipe and Other Methods of Infiltration Control

EXTRAMURAL PROJECT DIRECTOR:

Allen C. Ludwig, Project Manager
Texas Water Quality Board
P. O. Box 13246 - Capitol Station
Austin, Texas 78711

PROJECT NO.: 802651 (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $93,000

MERL PROJECT OFFICER:

Hugh Masters
Wastewater Research Division

BEGINNING DATE: 4/15/74

COMPLETION DATE: 10/77

PROJECT DESCRIPTION:

The objective of this grant proposal is to evaluate and compare impregnated concrete pipe under field conditions with plastic, plastic mortar, clay and asbestos-cement pipe. Continued laboratory studies on concrete pipe impregnation will be conducted to further refine correlations between field and laboratory tests. In addition, techniques for impregnating large diameter pipe will be developed so that more detailed economics can be determined. A grant continuation will provide a strength improvement evaluation of the impregnated pipe.

PROJECT TITLE: **Demonstration of Screening/Dissolved-Air Flotation Treatment as an Alternate to Combined Sewer Separation**

EXTRAMURAL PROJECT DIRECTOR:

Kenneth L. Huck
City of Racine
730 Washington Ave.
Racine, Wisc. 53403

MERL PROJECT OFFICER:

A. N. Tafuri
Wastewater Research Division

PROJECT NO.: 11023 FWS (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $1,046,039

BEGINNING DATE: 6/24/70

COMPLETION DATE: 2/15/76

PROJECT DESCRIPTION:

A 700-acre drainage area in the City of Racine, Wisconsin, has a total of 53 outfalls on a four-mile stretch of the Root River. Of these outfalls, 17 are separate storm sewers and 36 are combined sewer overflow relief points. Several outfalls will be intercepted and the flows directed to five riverside treatment units, of which three will treat combined sewage, one will treat storm water only, and one will treat both. The untreated excess combined sewage and urban runoff produce high shock loads on the receiving water during rain events or snow melt. Rather than separation of the combined systems, an alternate of treating the sewage by screening down to 200 microns then flocculation and flotation with pressurized dissolved-air will be demonstrated. There will also be verification of a recently developed combined sewer/water quality mathematical model.

PROJECT TITLE: Demonstration of a Solids Separator System for Control of Combined Sewer Overflows

EXTRAMURAL PROJECT DIRECTOR:

Thomas Darmody
City of Lancaster
Municipal Building
120 North Duke Street
Lancaster, Pennsylvania

MERL PROJECT OFFICER:

Richard Field
Wastewater Research Division

PROJECT NO.: S802208 (11023 GSC)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $1,284,850

BEGINNING DATE: 6/1/71

COMPLETION DATE: 8/78

PROJECT DESCRIPTION:

The objective of this project is the demonstration of the feasibility of controlling combined sewer overflows by storage. Stored flow will be discharged to the existing municipal sewerage system for subsequent treatment during non-peak flow periods. Excessive overflows caused by intense rainfalls which cannot be contained will be treated by fine mesh screens and disinfected prior to discharge. A vortex device will be developed and demonstrated, which will have the dual capabilities of overflow regulation (controlled diversion) and treatment by liquid-solids separation. During overflows, the concentrate will be directed to the existing sewerage system. The grantee will employ the Storm Water Management Model as a design and evaluation tool. The model will also be further developed to include a decision-making capability to identify effective least-cost alternative as part of the development and implementation of a plan for control of combined sewer overflows for an entire urban area, using the City of Lancaster as an example.

PROJECT TITLE: **Demonstration of Void Space Storage with Treatment and Flow Regulation**

EXTRAMURAL PROJECT DIRECTOR:

C. E. Susong
City of Akron
166 South High Street
Akron, Ohio 44308

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

PROJECT NO.: 11020 DXH (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $562,500

BEGINNING DATE: 5/23/69

COMPLETION DATE: 9/76

PROJECT DESCRIPTION:

The objective of this project is to construct, operate, and evaluate an underground storage/treatment facility for excess combined sewage. The facility will include novel concepts in construction and operation. It will be an excavated hopper-shaped cavity, lined with an impermeable membrane, filled with an inert material, covered with soil and the surface made usable. Storage will be in the void space of the fill. The flow regulation of influent will be a new and improved device, probably a fluidic regulator. The sewage will be pre-treated prior to entry to the storage facility. Tube clarifiers will be utilized to compare results with an on-going project where these units are being used for the first time at an operational level on combined sewage.

PROJECT TITLE: Development and Demonstration of Combined Sewage Treatment Utilizing Screening and Split-Flow Air Flotation

EXTRAMURAL PROJECT DIRECTOR:

Dr. William Katz
Environmental Sciences Division, Envirex,Inc
P. O. Box 2022
Milwaukee, Wisconsin 53201

MERL PROJECT OFFICER:

A. N. Tafuri
Wastewater Research Division

PROJECT NO.: 11023 FDC (Contract)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $378,322

BEGINNING DATE: 10/6/67

COMPLETION DATE: 6/1/76

PROJECT DESCRIPTION:

The objective of this project is to study, design, fabricate, and demonstrate a system for the treatment of combined sewer overflows using new techniques of screening chemical oxidation and/or air flotation. The system to be studied will evaluate fine screening techniques for solids removal followed by chemical oxidation and disinfection or air flotation and disinfection prior to discharge of the effluent. The fine screening phase is intended to reduce the organic loading so that chemical-ozidant costs and detention time in the oxidation zone may be held to a minimum. The chemical oxidants (H_2O_2, Cl_2, and O_3) will be introduced into a rapid mix zone followed by a mixing baffle detention zone to allow contact time for oxidation of the organic material. The dissolved air flotation unit will be operated at recycle rates from 5 percent to 30 percent of total flow and from 40 to 80 psig air pressure. These data will be utilized to design and demonstrate the flow-through system of a MGD capacity to be evaluated in Milwaukee, Wisconsin.

PROJECT TITLE: Development of Electromagnetic Flowmeters for Combined Sewers

EXTRAMURAL PROJECT DIRECTOR:

Dr. Vincent Cushing
Cushing Engineering, Inc.
3364 Commercial Avenue
Northbrook, Illinois 60062

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

PROJECT NO.: 802400 (Contract)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $133,248

BEGINNING DATE: 4/1/73

COMPLETION DATE: 10/76

PROJECT DESCRIPTION:

The proposer plans to design, construct, and test a reliable and obstructionless sewer flowmeter based on a modification of the conventional electromagnetic flowmeter principle (used for pressurized flow). The "open-channel" combined sewer flowmeter will have a primary unit (transducer) not appreciably more complicated than the conventional instrument, the main difference being more electrodes placed at various depths to measure different levels of gravity flow in the pipe. Based on the verification of the existing magmeter for pressure flow and available technology, this device offers a very high potential for success.

PROJECT TITLE: Development of New and Improved Devices for Automatic Sampling of Sewer and Combined Sewers Flows

EXTRAMURAL PROJECT DIRECTOR:

Phil Shelly, Ph.D.
Hydrospace-Challenger, Inc.
2150 Fields Road
Rockville, Maryland 20850

MERL PROJECT OFFICER:

H. E. Masters

PROJECT NO.: 68-03-0155 (Contract)
PROGRAM ELEMENT: 1BB034
ROAP: 21ASY

EPA SUPPORT: $115,946

BEGINNING DATE: 6/72

COMPLETION DATE: 8/73

PROJECT DESCRIPTION:

The project is a seventeen month development and demonstration of devices capable of collecting and preserving representative samples of sewage from storm and combined sewers under all expected flow conditions. Work planned includes development of a complete state-of-the-art and assessment of sampling equipment and techniques, including types of samplers and advantages and limitations of each with respect to S & CS conditions, engineering to adapt and/or modify existing sampling equipment to effective operation under S & CS conditions.

New concepts will be considered if the preliminary data submitted indicates feasibility; assemble and laboratory test each sampling device, report demonstrating the device capable of meeting usage requirements, installation of device at suitable field test site and on-site evaluation of the device under actual operating conditions.

PROJECT TITLE: Development of a Passive Flow Measurement System for Storm and Combined Sewers

EXTRAMURAL PROJECT DIRECTOR:

Kenneth M. Foreman, Research Engineer
Grumman Ecosystems Corporation
1111 Stewart Avenue
Bethpage, New York 11714

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

PROJECT NO.: 68-03-2121 (Contract)
PROGRAM ELEMENT: 1BB034
ROAP: 21ASY

EPA SUPPORT: $50,000

BEGINNING DATE: 6/74

COMPLETION DATE: 3/76

PROJECT DESCRIPTION:

The objective of this project is to demonstrate a new, non-intrusive, low cost, reliable, passive measurement system capable of monitoring flow for the highly variable conditions encountered in storm, combined and sanitary sewers.

The system's concept involves a proprietary technique of utilizing the sound emission resulting from the interaction of fluid flow with a discontinuity of a solid surface. In this application to sewer flow, a discontinuity is any inherent change in the sewer cross-section, slope, or direction that can significantly affect the flow area or direction.

The first phase of the project will include laboratory investigations directed to optimize system design details for sewer installations, and analyses which will relate theory and test data to measurement system design objectives and applications. A short duration field test preview will be conducted in the contractor's facilities, using breadboard equipment, to exemplify the nature of output data to be obtained in a much more extensive field test program scheduled for a second phase effort.

PROJECT TITLE: **Development of a Swirl Concentrator and a Helical Combined Dual Functioning Separator, Regulator**

EXTRAMURAL PROJECT DIRECTOR:	PROJECT NO.: 68-03-0272 (Contract)
Richard H. Sullivan, General Manager APWA Research Foundation American Public Works Association 1313 East 60th Street Chicago, Illinois 60637	PROGRAM ELEMENT: 1BB034 ROAP: 21ASY EPA SUPPORT: $387,451
MERL PROJECT OFFICER:	
Richard Field Wastewater Research Division	BEGINNING DATE: January 1975 COMPLETION DATE: March 1976

PROJECT DESCRIPTION:

A high return on this total investment may be found in the adopted use of swirl and helical regulators, controling both quantity and quality of overflow to receiving waters. Universalization of the swirl regulator/separator and development of the helical regulator/separator will open the door for usage of these devices in American practice. Additional returns may be realized in the development and use of the swirl concentrator in place of conventional sedimentation. An increase of $49K was recommended in order to take advantage of a proposed modeling set up by expanding the scope to include further swirl separator refinements for treatment of domestic wastewater, stormwater, and erosion runoff along with combined sewage.

PROJECT TITLE: Disinfection/Treatment of Combined Sewer Overflows-Syracuse, New York

EXTRAMURAL PROJECT DIRECTOR:

John M. Karanik, Projects Officer
Onondaga County Dept. of Public Works
650 West Hiawatha Blvd.
Syracuse, New York 13202

MERL PROJECT OFFICER:

Richard Field
Wastewater Research Division

PROJECT NO.: S802400 (11020 HFR)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $1,104,984

BEGINNING DATE: 7/30/71

COMPLETION DATE: 11/76

PROJECT DESCRIPTION:

The objective of this project is to demonstrate the prevention of pollution of Lake Onondaga caused by enteric organisms in combined sewage discharge. The treatment proposed is fine screening and oxidation/disinfection at selected stationary, sequential, microstrainer and high speed rotary. There will also be a solids/liquid separation utilizing the swirl separator. Disinfection has been evaluated utilizing gaseous chlorine and chlorine dioxide generated on site, by a new and improved technique. A final report, EPA-670/2-75-021 entitled, "Bench-Scale High-Rate Disinfection of CSO's with Chlorine and Chlorine Dioxide," has been published. Dosage, points of application, aftergrowth, and other factors in kill efficiency, will be carried out. A special virus disinfectant study will also be included in the project. A supplement to this grant entitled, "Nutrient Removal Using Existing CSO Treatment Facilities", will test/evaluate the feasibility of nutrient removal with additional process units at a full-scale combined sewer overflow treatment demonstration site in Syracuse, New York.

Alum will be fed at the proposed filter inlet and the alum flox will be allowed to penetrate into the anthracite media which will affect phosphate removal. Furthermore, the ammonia nitrogen will be reduced by the zeolite media at the bottom layer of the filter bed. The system is expected to have 80% of nutrient removal efficiencies.

Regeneration of alum sludge and exhausted zeolite as well as Badger solids monitor will also be evaluated.

Another supplement to this grant will conduct in situ test on SCS developed instrumentation (automatic sampler and TOC analyzer). In order to complete the objectives of the overall project, ten (10) additional combined sewer overflow events will also be monitored under this supplement.

PROJECT TITLE: East Chicago Treatment Lagoon

EXTRAMURAL PROJECT DIRECTOR:

East Chicago Sanitary District
East Chicago, Indiana

PROJECT NO.: 11023 FAV (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $1,044,120

MERL PROJECT OFFICER:

H. E. Masters

BEGINNING DATE: 12/23/66

COMPLETION DATE: 3/23/73

PROJECT DESCRIPTION:

The objective of this project is to evaluate the effectiveness of treating combined sewer overflow in a very deep detention basin having aerobic and anaerobic levels of treatment. The aerobic treatment is accomplished by large oxygen transfer units suspended on surface of basin waters. The prime objective of the project is to demonstrate a control method to optimize the quality of treatment to storm water and combined sewage mixed with industrial wastewater. This treatment will render a more acceptable discharge to the receiving waters. The demonstration will assess design criteria for detention basins to provide storage and treatment to storm water and combined sewer overflows; design requirements for large oxygen transfer units in relation to volumes of wastewater and quality of effluent.

Project being terminated.

PROJECT TITLE: Efficiency of Off-Stream Detention-Retention Measures as Sediment Control Devices

EXTRAMURAL PROJECT DIRECTOR:

Dr. Lilia A. Abron-Robinson
Department of Civil Engineering
Howard University
Washington, D.C. 20001

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

PROJECT NO.: 803066 (Contract)
PROGRAM ELEMENT: 1BB034
ROAP: 21ASY

EPA SUPPORT: $33,150

BEGINNING DATE: 6/74

COMPLETION DATE: 9/76

PROJECT DESCRIPTION:

This study has the objectives: (a) to evaluate the effectiveness of off-stream detention-retention of surface stormwater runoff as sediment control devices and (b) to establish technical guidelines to aid designer in selecting the most efficient detention-retention facility. Available field data will be assembled and analyzed to evaluate the efficiency of each type of control measure. Theoretical approach will be taken to develop trap efficiency equations for different types of device, based on fundamental principles of hydraulics and sediment transport. The theoretical work will be checked by the field data. It is envisioned that with this theoretical approach the design can be safely extrapolated beyond the data range available. Other factors such as costs of construction and maintenance will also be considered in establishing technical guidelines.

PROJECT TITLE: Evaluation of Present Catch Basin Technology and Demonstration and Evaluation of New Up-Stream Attenuator/Solids Separator Design

EXTRAMURAL PROJECT DIRECTOR:

John A. Lager, Vice President: Project Dir.
Metcalf & Eddy, Inc.
1029 Corporation Way
Palo Alto, California

MERL PROJECT OFFICER:

A. N. Tafuri
Wastewater Research Division

PROJECT NO.: 68-03-0274 (Contract)
PROGRAM ELEMENT: 1BB034
ROAP: 21ASY

EPA SUPPORT: $106,673

BEGINNING DATE: 6/11/73

COMPLETION DATE: 12/12/75

PROJECT DESCRIPTION:

Objectives. The objectives of this project are to assess and disseminate current catch basin technology and to describe, evaluate, and demonstrate improved devices for flow alternatives and solids separation.

Approach

Phase I a. To perform an overview and assessment of the current catchbasin technology, including an economic comparison between catchbasins and other alternatives.

b. To recommend either elimination of catchbasins, their modification, or the development and description of new designs, to produce a final Phase I report that will be of use to municipal officials responsible for construction and operation of sewerage systems.

Phase II a. To develop and test modifications for existing catchbasins or new designs of flow attenuation/solids separation. This phase is expected to require hydraulic modeling and limited field testing.

b. To produce a final Phase II report that will include plans, specifications, and cost estimates and effectiveness evaluation guidelines to assist municipal officials.

PROJECT TITLE: Evaluation of Spring Creek Auxiliary Pollution Control Project

EXTRAMURAL PROJECT DIRECTOR:

William Pressman
Department of Water Resources
City of New York
Municipal Building, Room 2454
New York, New York 10007

MERL PROJECT OFFICER:

Anthony Tafuri
Wastewater Research Division

PROJECT NO.: 11023 FAO (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $844,500

BEGINNING DATE: 12/26/67

COMPLETION DATE: 2/15/76

PROJECT DESCRIPTION:

The objective of this project is to establish pre-construction water quality conditions in Jamaica Bay, Spring Creek Area, and location of all sources contributing to pollution of the Bay. Overflows from combined sewers contribute significantly to the pollution of Jamaica Bay, New York City in constructing a major combined sewage treatment facility "Spring Creek Auxiliary Pollution Control Project" specifically designed to provide sedimentation and chlorination treatment to combined sewage. Characterization of parameters that measure the effects of combined sewers will be a part of the investigations. Following construction the effectiveness of the combined sewage treatment facilities will be evaluated. It is anticipated that the Spring Creek facility will serve as a prototype for additional projects leading to an upgrading of the quality of Jamaica Bay waters.

PROJECT TITLE: Evaluation and Technology Transfer of the Swirl Concentrator Principle

EXTRAMURAL PROJECT DIRECTOR:

Richard H. Sullivan
American Public Works Association
1313 East 60th Street
Chicago, Illinois 60637

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

PROJECT NO.: S 803157 (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $65,000

BEGINNING DATE: 1/75

COMPLETION DATE: 5/76

PROJECT DESCRIPTION:

The overall objective of this demonstration project is to provide vehicles for the rapid dissemination of information concerning the swirl concentrator and the helical bend regulator. Technology transfer in the field of public works is best accomplished by evaluation of prototype or full size units and by contact with the engineers who must plan and design pollution control facilities. The six parts of this proposal are designed to provide the basis for transfer of the technology to the profession. Parts C thru F will be funded by others.

The six parts are:

A. Evaluation of a Swirl Concentrator Grit Chamber;
B. Evaluation of a Swirl Concentrator Primary Technical Device:
C. Preparation of a textbook on Design of Facilities Utilizing Secondary Motions;
D. Preparation of a motion picture describing the Swirl Concentrator Facilities which have been constructed;
E Conduct of a seminar on the Design and Application of the Swirl Concentrator and Helical Bend Regulator; and
F Preparation of the Proceedings of the seminar.

PROJECT TITLE: Flocculation-Flotation Concept for Sewage Solids Separation

EXTRAMURAL PROJECT DIRECTOR:

Hercules, Inc.
910 Market Street
Wilmington, Delaware 19899

MERL PROJECT OFFICER:

Richard Field
Wastewater Reasearch Division

PROJECT NO.: 11023-EYC (Contract)
PROGRAM ELEMENT: 1BB034
ROAP: 21ASY

EPA SUPPORT: $110,291

BEGINNING DATE: 4/22/70

COMPLETION DATE: 1/76

PROJECT DESCRIPTION:

This project will develop and assess variables associated with flocculation as an aide to flotation, i.e., flocculant concentration vs. bouyant effect, sewage solids shock load effect, optimum scheme and permissible flow for treatment.

PROJECT TITLE: Humbolt Avenue Overflow Detention and Chlorination Facility

EXTRAMURAL PROJECT DIRECTOR:

Herbert Goetsch
Public Works, City of Milwaukee
841 North Broadway
Milwaukee, Wisconsin 53202

MERL PROJECT OFFICER:

D. Cesareo

PROJECT NO.: 11023 FAU (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $1,468,589

BEGINNING DATE: 10/15/66

COMPLETION DATE:

PROJECT DESCRIPTION:

The objective of this project is to demonstrate effectiveness of a detention tank and chlorination facilities for the treatment of combined sewer overflows. The tank influent will be screened. Design of tank is based on a 15 minute detention time for sedimentation and chlorination. After overflows, the sludge deposits and wastewater will be pumped back to the existing treatment plant. Aside from typical testing, the evaluation will include river monitoring.

PROJECT TITLE: Large Scale Demonstration of Treatment of Storm-Caused Overflow by the Screening Method

EXTRAMURAL PROJECT DIRECTOR:

Paul Brunner
City of Fort Wayne
308 East Beery Street
Fort Wayne, Indiana 46802

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

PROJECT NO.: 11020 GYU (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $1,067,000

BEGINNING DATE: 4/29/71

COMPLETION DATE: 6/76

PROJECT DESCRIPTION:

The objective of this project is to install rotating fine screens for the purpose of removing solids from combined sewer overflows prior to discharge to a retention basin for further treatment with effluent from the city's secondary treatment plant. Disinfection will be provided. Detailed evaluation of the treatment process would be carried out.

PROJECT TITLE: The Lawrence Avenue Underflow Sewer System

EXTRAMURAL PROJECT DIRECTOR:

City of Chicago
Department of Public Works
Chicago, Illinois

MERL PROJECT OFFICER:

Richard Field
Wastewater Research Division

PROJECT NO.: 11022 EMD (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $1,500.000

BEGINNING DATE: 3/30/67

COMPLETION DATE: 9/77

PROJECT DESCRIPTION:

The objective of this project is to evaluate the effectiveness of employing a deep tunnel system within a highly developed urban area to temporarily store excess combined sewer flows for return to the sewage treatment plant during off-peak hours. This project will reduce the discharge of untreated combined sewage to the receiving stream and minimize overloading the waste treatment plant. Should this method of control prove to be economically feasible the use of advanced tunneling equipment, present plans in the Chicago metropolitan area envisions a vast network of deep tunnels for ultimate control of all waters in excess of that which can be conducted by the existing drainage systems.

PROJECT TITLE: Micro-Organisms in Stormwater

EXTRAMURAL PROJECT DIRECTOR:

Cornelius W. Kruse, Professor and Chairman
Dept. of Environmental Health
The Johns Hopkins University
Charles & 34th Streets
Baltimore, Maryland

MERL PROJECT OFFICER:

Richard Field
Wastewater Research Division

PROJECT NO.: R802709 (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $15,000

BEGINNING DATE: 5/1/74

COMPLETION DATE: 10/76

PROJECT DESCRIPTION:

The objective of the study is to provide basic information upon which a more scientific evaluation may be made regarding the health hazard potential of stormwater in the urban setting. It is proposed to determine the presence and concentration of selected pathogenic organisms including other than enteric forms. The relationship of these pathogens to the customary microbiological indication of sanitary water quality will be established. The results should suggest the type and degree of stormwater treatment necessary for the protection of health. Routine sampling will be made sewage at the wastewater treatment plant for reference and waters flowing in the urban streams to obtain background information. Sampling stations for stormwater will be set up at six sites ranging from relatively clean residential drainage area to the inner city characterized by industries and heavy residential areas. One of the sampling stations will be a combined sewer system.

The study will, of necessity, include evaluation of sampling equipment and methods and cultured materials. The project is expected to be completed in two years.

PROJECT TITLE: Nutrient Removal Using Existing CSO Treatment Facilities

EXTRAMURAL PROJECT DIRECTOR:

Mr. John J. Hennigan, Jr.
County of Onondaga
650 West Hiawatha Blvd.
Syracuse, New York 13204

MERL PROJECT OFFICER:

C. Y. Fan
Wastewater Research Division

PROJECT NO.: 802400 (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $14,000

BEGINNING DATE: 4/1/74

COMPLETION DATE: 9/1/75

PROJECT DESCRIPTION:

This work will be a supplement to the ongoing Onondaga County, New York grant 11020 HFR. It will test/evaluate the feasibility of nutrient removal with additional process units at a full-scale combined sewer overflow treatment demonstration site in Syfacuse, New York.

Alum will be fed at the proposed filter inlet and the alum flox will be allowed to penetrate into the anthracite media which will affect phosphate removal. Furthermore, the ammonia nitrogen will be reduced by the zeolite media at the bottom layer of the filter bed. The system is expected to have 80% of nutrient removal efficiencies.

Regeneration of alum sludge and exhausted zeolite as well as Badger solids monitor will also be evaluated.

PROJECT TITLE: Pilot Studies to Determine the Feasibility of Using High Gradient Magnetic Separation for Treating Combined Sewer Overflows

EXTRAMURAL PROJECT DIRECTOR:

Dr. John A. Oberteuffer
Sala Magnetics, Inc.
247 Third Street
Cambridge, Massachusetts 02141

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

PROJECT NO.: 68-03-2218 (Contract)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $14,000

BEGINNING DATE: 6/75

COMPLETION DATE: 5/76

PROJECT DESCRIPTION:

The contractor shall (1) demonstrate pilot-scale the effectiveness of a HGMS treatment system for treating combined sewer overflows and stormwater and more importantly use the information as a basis for a decision for larger scale evaluation; (2) develop basic design criteria and operating characteristics of the HGMS system in a form that can be translated into larger scale; (3) project capital and operating costs based on the demonstrated treatment system; and (4) investigate the feasibility of HGMS for dual use (integrated wet and dry weather treatment systems).

PROJECT TITLE: Program for Demonstrating Combined Sewer Overflow Control Techniques for Water Quality Improvement and Beach Protection

EXTRAMURAL PROJECT DIRECTOR:

City of Cleveland
City Hall
601 Lakeside Avenue
Cleveland, Ohio 44114

MERL PROJECT OFFICER:

A. N. Tafuri
Wastewater Research Division

PROJECT NO.: 11023 EZW (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $325,162

BEGINNING DATE: 6/3/68

COMPLETION DATE: 5/1/76

PROJECT DESCRIPTION:

The objectives of this project are to apply several control and treatment methods designed to abate pollution from combined sewer overflows and control of water quality at the Edgewater and White City bathing beaches on Lake Erie in the City of Cleveland. Control and treatment measures to be applied include:

1) hypochlorination of combined sewer overflows and local streams contributing to pollution of beach areas;
2) use of polymers to reduce overflows by increasing interceptor flow capacity;
3) initiation of a sewer flushing program to reduce solids discharged from the drainage area tributary to the Edgewater overflow;
4) screening of overflows and streams;
5) construction of sheet piling and flexible barriers to enclose beach areas;
6) control of water quality within enclosed beach areas;
7) collection of debris and coarse solids; and
8) miscellaneous sewerage system improvements.

PROJECT TITLE: The Somerville Marginal Conduit Including Pretreatment Facilities

EXTRAMURAL PROJECT DIRECTOR:

Martin Weiss
Metropolitan Dist. Comm.
20 Somerset Street
Boston, Mass.

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

PROJECT NO.: 11023 DME (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $452,000

BEGINNING DATE: 8/31/70

COMPLETION DATE: 2/15/76

PROJECT DESCRIPTION:

The objective of this project is to develop, demonstrate and evaluate treatment method for excess combined sewage. The treatment will consist of screening and chlorination. A suitable scrcening technique will be developed. The chlorination process will involve new and improved utilization of high current density electrolytic process to generate a sodium hypochlorite solution for disinfection of combined sewage. The construction will be coordinated with adjacent highway construction and drainage and recreational water protection.

PROJECT TITLE: **State of the Art Update on Storm and Combined Sewer Overflow Management and Treatment**

EXTRAMURAL PROJECT DIRECTOR:

John A. Loger
Metcalf & Eddy, Inc.
1029 Corporation Way
Palo Alto, California 94303

MERL PROJECT OFFICER:

Richard Field
Wastewater Research Division

PROJECT NO.: 68-03-2228

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $199,209

BEGINNING DATE: 4/15/75

COMPLETION DATE: 3/77

PROJECT DESCRIPTION:

The U. S. Environmental Protection Agency (EPA) desires a continuation and update of previous contract "State-of-the-Art on Storm and Combined Sewer Overflow Management and Treatment," 68-03-0179 to include source and discharge pollutant loading parameters (values, receiving water impact analyses and example municipal wet-weather flow characterization and control analyses; and the basic methodologies for determining these values and making these analyses. The objective of this contract is to improve and accelerate the transfer of new technology in the field of urban stormwater management from the researcher to the potential user. The final report would be directed at the user engineer/manager with particular emphasis on (1) approach methodology through illustrative problem solving; (2) case history updates; and (3) data base expansion. The report would be a supplement to, not a replacement of, the comprehensive text "Urban Stormwater Management and Technology: An Assessment," EPA-670/2-74-040.

PROJECT TITLE: Technology - A Manual of Instruction Engineering Aspects of Storm and Combined Sewer Overflow

EXTRAMURAL PROJECT DIRECTOR:

Mr. A. H. Shepard
Assistant Vice President and Treasurer
North Carolina State University
P. O. Box 5993
Raleigh, North Carolina 27607

MERL PROJECT OFFICER:

A. N. Tafuri
Wastewater Research Division

PROJECT NO.: 801358 (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $27,882

BEGINNING DATE: 6/15/73

COMPLETION DATE: 6/15/76

PROJECT DESCRIPTION:

This project will develop a detailed graduate level manual on the engineering aspects of Storm and Combined Sewer Overflow Management and Control, and will test the manual in a graduate level course at North Carolina State University by utilizing it as a course text.

PROJECT TITLE: Trenchless Sewer Construction and Sewer Design Innovations

EXTRAMURAL PROJECT DIRECTOR:

William Henry, County Engineer
Sussex County Council
Georgetown, Delaware 19947

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

PROJECT NO.: S-800690 (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $796,238

BEGINNING DATE: 7/8/72

COMPLETION DATE: 9/77

PROJECT DESCRIPTION:

The project is to demonstrate a new sewer construction method which will be less costly and more rapid than conventional construction, and overcome the problems of high water table, unstable soil, associated infiltration and expensive manhold installation. The technique is to utilize the "trenchless" pipe laying system developed in England. The process uses an electro-optically-controlled blade which "plows in" the pipe as it moves along. Other important sewer design innovations will be demonstrated: new manhold construction and substitute clean-outs, improved sewer piping (PVC), jointing, and coating materials a new screw type sewage pump which requires no wet well. A thorough two year post-construction evaluation is to be included.

PROJECT TITLE: Ultra High Rate Filtration of Combined Sewer Overflows and Raw Sewage

EXTRAMURAL PROJECT DIRECTOR:

N. Nash, Deputy Director (Plants)
Dept. of Water Resources
New York City, New York

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

PROJECT NO.: R803271 (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $120,000

BEGINNING DATE: 8/74

COMPLETION DATE: 5/76

PROJECT DESCRIPTION:

The objectives of this project are (1) to confirm the technological advantage and high parameters of treatment performance of UHR filtration of combined sewer overflows (see EPA Project #11023EYI); (2) to obtain the appropriate design parameters to apply to full scale facilities; (3) to determine the feasibility of UHR Filtration to perform the dual function of treating combined sewer overflows and raw dry weather sewage.

A pilot plant will be constructed to filter the combined sewer overflows and raw dry weather sewage. The pilot plant will operate for a four month period testing storm overflows and dry weather flow. Data will be compiled to determine operating procedures, flux rates, contaminant removal efficiencies, (suspended solids, BOD, and COD), backwash procedures, backwash water characteristics and backwash water handling methods.

A 30-inch diameter filter column and two 6-inch diameter filter columns will be utilized for the pilot plant. Upon successful operation of the pilot plant, consideration will be given to construction of a demonstration plant.

PROJECT TITLE: Use of Polymers to Reduce or Eliminate Sewer Overflow in the Bachman Creek Sewer

EXTRAMURAL PROJECT DIRECTOR:

A. E. Holcomb
City of Dallas
500 South Ervay Street
Dallas, Texas 75201

MERL PROJECT OFFICER:

Richard Field
Wastewater Research Division

PROJECT NO.: 11022 DZU (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ASY

EPA SUPPORT: $331,233

BEGINNING DATE: 5/23/69

COMPLETION DATE: 3/76

PROJECT DESCRIPTION:

The objective of this project is to design, construct, and evaluate a permanent polymer injection station on the Bachman Creek Sewer in Dallas, Texas. This project will further demonstrate and evaluate a technique developed earlier for FWPCA by contract which utilizes injection of polymers into a sewer for the purpose of increasing the carrying capacity of the pipe. During periods of wet weather the Bachman Creek sewer receives excess quantities of ground or stormwater due to infiltration. The flow then exceeds its carrying capacity and untreated wastes overflow in at least ten locations, causing pollution of Bachman Creek. This project will seek to eliminate or greatly reduce the number and volume of untreated overflows by increasing the flow capacity of the Bachman Creek Sewer through the addition of polymers. Design criteria, operating techniques, optimum polymer concentration and other pertinent data critical to the intended use will be evaluated.

PROJECT TITLE: Wastewater Flow Measurement in Sewers Using Ultrasound

EXTRAMURAL PROJECT DIRECTOR:

Ronald J. Anderson
Sewerage Commission of the City of Milwaukee
P. O. Box 2079
Milwaukee, Wisconsin 53201

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

PROJECT NO.: 11024 FVQ (Grant)
PROGRAM ELEMENT: 1BB034
ROAP: 21ASY

EPA SUPPORT: $146,250

BEGINNING DATE: 3/26/71
COMPLETION DATE: 5/15/76

PROJECT DESCRIPTION:

The objective of this project is to improve sanitary, storm and combined sewer regulation by application and demonstration of new technology for measurement of sewage volume flow. To implement this objective, two sewers in the Milwaukee Metropolitan Sewerage System will be instrumented with newly developed ultrasonic velocity and level measurement equipment. The purpose of the equipment is to provide a measurement of sewage volume flow suitable for regulation systems which, in addition to conventional gravity flow, involve sewage, gating, pumping and short term retention of storage. The sewage metering equipment to be demonstrated is of sufficiently low cost to achieve general use, can be conveniently installed in existing sewers, is non-fouling and is suited by design to long-term operation in the sewer environment.

PROJECT TITLE: Comparison of Alternate Sewer Designs

EXTRAMURAL PROJECT DIRECTOR:

Harry P. Frank
City of Elizabeth
50 West Scott Place
Elizabeth, New Jersey 07201

MERL PROJECT OFFICER:

A. N. Tafuri
Wastewater Research Division

PROJECT NO.: 802971 (Grant)
PROGRAM ELEMENT: 1BB034
ROAP: 21ATA

EPA SUPPORT: $100,000

BEGINNING DATE: 7/1/74

COMPLETION DATE: 6/30/76

PROJECT DESCRIPTION:

The objective of this grant proposal is to evaluate three sewer system designs incorporating cost-effective analysis for each system. The three designs to be evaluated are: 1) conventional storm and sanitary, 2) conventional combined, and 3) advanced combined system which incorporates in-sewer storm flow storage and controlled routing. A comparative cost-effective analysis based on a desired receiving water and/or effluent quality will be made of these three sewer designs. Comparison of system design will include conventional vs. advanced hydrologic and hydraulic methodology. In conventional design, the engineers employ older concepts such as the Rational Method for runoff computation and the Manning or Kutter equations for determination of sewer size and slope. These methods have often been the subject of criticism due to their inaccuracies.

PROJECT TITLE: Demonstrate Real-Time Automatic Control of Combined Sewer System

EXTRAMURAL PROJECT DIRECTOR:

A. O. Friedland, Project Director,
Head, Div. of Sanitary Engineering
City and County of San Francisco
770 Golden Gate Avenue
San Francisco, California 94102

MERL PROJECT OFFICER:

A. N. Tafuri
Wastewater Research Division

PROJECT NO.: 803743 (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ATA

EPA SUPPORT: $195,000

BEGINNING DATE: 5/1/75

COMPLETION DATE: 5/31/78

PROJECT DESCRIPTION:

The principal objective of this project will be to demonstrate that real-time automatic operational control technology can be implemented for combined sewer systems in metropolitan areas. To accomplish this objective, the project will be divided into two major phases: (a) a development phase, and (b) an application phase.

The development work will include the following three items:

(a) Development of the control software for the demonstration system,
(b) Development of a short-term (minutes and hours) rainfall prediction capability, and
(c) Development of a relatively simple rainfall-runoff model that can be used for real-time simulation.

The ultimate product of the development phase will be the control system software required for the prototype demonstration system. However, a major objective of this phase will be to approach the developmental work in a generalized manner to the maximum extent possible so that the results of this work can be used by other cities contemplating real-time automatic control of their storm drainage systems.

The objectives of the application phase of the study are:

(a) To demonstrate how the generalized simulation and control models developed in the first phase of the work would be adapted to a specific system, and
(b) To show that the automatic real-time control system will work as it was intended.

PROJECT TITLE: Establishment of An Urban Rainfall/Runoff Data Base

EXTRAMURAL PROJECT DIRECTOR:

James P. Heaney
Dept. of Environmental Engineering Sciences
College of Engineering
University of Florida
Gainesville, FL 32611

MERL PROJECT OFFICER:

A. N. Tafuri
Wastewater Research Division

PROJECT NO.: 68-03-0496 (Contract)

PROGRAM ELEMENT: 1BB034

ROAP: 21ATA

EPA SUPPORT: $48,500

BEGINNING DATE: 6/30/74

COMPLETION DATE: 2/28/76

PROJECT DESCRIPTION:

An urban rainfall/runoff data base will be established for evaluation and testing of rainfall/runoff simulation models. The requisite data include not only rainfall/runoff/catchment characterization but also specific information on water quality and flow-rate measurements (as functions of time) of sewered/non-sewered stormwater and combined sewer catchment and discharge points as well as climatological, demographic and related data. Documentation will include data collection criteria, data sources, data base dissemination methods and methods of continuous data base maintenance. Actual computer data storage will be in tape and card form.

PROJECT TITLE: Evaluation of a Mathematical Model for Engineering Assessment, Control, Planning and Design of Storm and Combined Sewerage Systems.

EXTRAMURAL PROJECT DIRECTOR:

Dr. Albin Brandstetter
Battelle Memorial Institute
Pacific Northwest Laboratories
P. O. Box 999
Richland, Washington 99352

MERL PROJECT OFFICER:

C. Y. Fan
Wastewater Research Division

PROJECT NO.: 68-03-0251 (Contract)

PROGRAM ELEMENT: 1BB034

ROAP: 21ATA

EPA SUPPORT:

BEGINNING DATE:

COMPLETION DATE:

PROJECT DESCRIPTION:

The proposed project will evaluate presently available mathematical models used for the assessment, control, planning, and design of storm and combined sewerage systems. A literature review will be conducted, including the collection of model descriptions and associated computer programs. The most promising models for practical applications will be tested using a hypothetical set of data. The models will then be evaluated considering the cost of model use, computer requirements, model accuracy, data requirements, input data preparation requirements, and output options available to the user. The evaluations will be documented in such a way that the practicing engineer will be able to decide which of the models will best meet his requirements. It is planned that the project will be initiated in May 1973, that model evaluation will be conducted during the remainder of 1973, and that model documentation will be completed in May 1974.

PROJECT TITLE: A Guide for Comprehensive Planning for Control of Urban Storm and Combined Sewer Runoff

EXTRAMURAL PROJECT DIRECTOR:

Dr. Wayne C. Huber
Dept. of Environmental Engineering Sciences
University of Florida
College of Engineering
Engineering & Industrial Exp. Sta.
Gainesville, FL 32601

MERL PROJECT OFFICER:

A. N. Tafuri
Wastewater Research Division

PROJECT NO.: 802411

PROGRAM ELEMENT: 1BB034

ROAP: 21ATA

EPA SUPPORT: $69,569

BEGINNING DATE: 6/1/75

COMPLETION DATE: 11/31/77

PROJECT DESCRIPTION:

The Storm Water Management Model (SWMM) has proven itself to be a useful computer simulation tool for studies of pollution caused by storm and combined sewer overflows. However, documentation of model usage lacks a clear, concise, logical sequence for users to follow. An extensive effort will be made to revise the present User's Manual to correct for this defect and others and to completely update the model. In addition, refinements will be added to flow routing procedures to account better for backwater, interconnections and surcharging. Treatment and solids handling alternatives other than those presently considered in the SWMM will be examined for application to pollution control. Finally, planning guidelines will be prepared for use by those charged with obtaining least cost, yet environmentally sound solutions to urban drainage and pollution problems. These guidelines will include the results of all available research.

PROJECT TITLE: The State of the Art and Future Direction of Urban Water Management Model

EXTRAMURAL PROJECT DIRECTOR:

Water Resources Engineers, Inc.
710 South Broadway, Suite 200
Walnut Creek, California 94596

PROJECT NO.: 68-03-0499 (Contract)

PROGRAM ELEMENT: 1BB034

ROAP: 21ATA

EPA SUPPORT: $90,000

MERL PROJECT OFFICER:

C. Y. Fan
Wastewater Research Division

BEGINNING DATE: 4/1/75

COMPLETION DATE: 6/1/76

PROJECT DESCRIPTION:

The U. S. Environmental Protection Agency (EPA) desires to develop and demonstrate a model or analytic capability for assessing the effectiveness and cost of various measures for reducing or eliminating first flush pollution from combined sewers (including a routine for the design of combined sewers to prevent solids sedimentation at optimal construction cost, if shown to be feasible during initial, Phase I, investigation).

PROJECT TITLE: Urban Stormwater Management Short Course

EXTRAMURAL PROJECT DIRECTOR:

F. DiGiano, Assistant Professor
University of Massachusetts
Amherst, Massachusetts 01002

MERL PROJECT OFFICER:

A. N. Tafuri
Wastewater Research Division

PROJECT NO.: 803069 (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ATA

EPA SUPPORT: $25,499

BEGINNING DATE: 6/3/74

COMPLETION DATE: 8/31/76

PROJECT DESCRIPTION:

The objectives of the short course are to introduce the concepts and modeling techniques associated with the prediction, control and management of urban stormwater problems. The participants are anticipated to be from consulting firms and government agencies specializing in water resources and water quality systems design, management and planning.

A five day short course was scheduled to be held at the University of Massachusetts during the summer or fall of 1974. Guest speakers representing the distinguished personnel in the field will present seminar-type lectures during the short course. Special attention will be given to the use of the Environmental Protection Agency Stormwater Runoff Management Model (SWMM) to analyze urban stormwater problems. The lectures will be augmented by a series of case studies and workshops dealing with the technical aspects of using the computer model. An extensive set of notes will be published and distributed to participants prior to the course.

PROJECT TITLE: Analysis of Practices for Preparing an Economic Analysis and Determining Infiltration and Inflow

EXTRAMURAL PROJECT DIRECTOR:

Richard H. Sullivan, General Manager
APWA Research Foundation
1313 East 60th Street
Chicago, Ill. 60637

MERL PROJECT OFFICER:

A. N. Tafuri
Wastewater Research Division

PROJECT NO.: 803151- (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ATB

EPA SUPPORT: $78,001

BEGINNING DATE: 7/22/74

COMPLETION DATE: 2/15/76

PROJECT DESCRIPTION:

The objective of the study is to determine methods being utilized to determine infiltration and inflow, prepare a report and manual of practice to assist local agencies in conducting studies, develop standard procedures for economic analysis, and make recommendations to USEPA as to provisions of regulations.

PROJECT TITLE: Characterization and Treatment of Urban Land Runoff

EXTRAMURAL PROJECT DIRECTOR:

Dr. Newton Colston
Water Resources Research Institute
University of North Carolina
Raleigh, North Carolina 27607

MERL PROJECT OFFICER:

Anthony N. Tafuri

PROJECT NO.: 11030 HJP (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ATB

EPA SUPPORT: $106,672

BEGINNING DATE: 7/1/71

COMPLETION DATE:

PROJECT DESCRIPTION:

A 1.67 square mile drainage area in Durham, North Carolina, will be monitored over a two-year period, for the purpose of correlating storm water discharge quality with land use, rate of flow, storm characteristics, and runoff time, Laboratory pilot-scale studies will be conducted to evaluate the applicablility, effectiveness, and economics of sedimentation and physiochemical treatment of storm water discharges. Water quality management criteria will be developed to evaluate the relationship of storm water discharge control/ treatment versus advanced municipal waste treatment; in terms of cost and effectiveness to meet desired water quality levels.

PROJECT TITLE: Demonstration of Erosion and Sediment Control Technology

EXTRAMURAL PROJECT DIRECTOR:

Alvin L. Franks
Water Resources Control Board
1416 Ninth Street
Sacramento, California 95814

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

PROJECT NO.: S803181
PROGRAM ELEMENT: 1BB034
ROAP: 21ATB

EPA SUPPORT: $230,000

BEGINNING DATE: 7/74
COMPLETION DATE: 10/77

PROJECT DESCRIPTION:

The purpose of this demonstration is to develop an assessment of the cost effectiveness of sediment erosion control technology in a development, which has the climatic, topographic and vegetational and soil characteristics of the Tahoe area of California. The results will be used to establish erosion control standards for similar areas.

PROJECT TITLE: Demonstration and Evaluation of Sediment and Erosion Control Techniques Applicable to the Southeast Piedmont, Fairfield County, South Carolina

EXTRAMURAL PROJECT DIRECTOR:

Dr. Frank T. Caruccio
Department of Geology
University of South Carolina
Columbia, South Carolina 29208

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

PROJECT NO.:

PROGRAM ELEMENT: 1BB034

ROAP: 21ATB

EPA SUPPORT: $189,000

BEGINNING DATE: 7/75

COMPLETION DATE: 6/78

PROJECT DESCRIPTION:

The demonstration is a three-year study of the techniques and their efficiency in controlling sediment erosion and resulting water quality impairment in a Piedmont region of the southeastern U.S.A. Some preliminary baseline assessments of the water quality in the region will be made before construction is initiated.

PROJECT TITLE: Develop and Demonstrate New and Improved Model for Design of Combined Sewers to Prevent Solids Sedimentation and to Optimize Construction Costs

EXTRAMURAL PROJECT DIRECTOR:

Dr. Michael B. Sonnen
Water Resources Engineers
710 South Broadway
Walnut Creek, California 94596

MERL PROJECT OFFICER:

A. N. Tafuri
Wastewater Research Division

PROJECT NO.: 68-03-2205 (Contract)

PROGRAM ELEMENT: 1BB034

ROAP: 21ATB

EPA SUPPORT: $89,246

BEGINNING DATE: 6/75

COMPLETION DATE: 1/77

PROJECT DESCRIPTION:

This research is to determine whether technical means of simulating alternative methods for preventing sedimentation in combined sewers can be feasibly introduced to an existing mathematical model, a revised version of the EPA Storm Water Management Model (SWMM). Moreover, the feasibility of including cost estimation procedures in the same model or in a different model is to be determined. If both possibilities prove to be feasible, the necessary programming and testing will be undertaken in the second part of the study.

Plans are to make concerted effort to include technical and economic subroutines in an existing model, rather than to develop a new model.

PROJECT TITLE: Develop and Evaluate Methods for Determining Cumulative Stormwater Runoff Volumes and Flowrates

EXTRAMURAL PROJECT DIRECTOR:

Ven Te Chow
Dept. of Civil Engineering
University of Illinois at Urbana-Champaign
Urbana, Ill. 61801

MERL PROJECT OFFICER:

Richard Field
Wastewater Research Div.

PROJECT NO.: 68-03-0302 (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ATB

EPA SUPPORT: $61,000

BEGINNING DATE: 8/1/73

COMPLETION DATE: 1/15/77

PROJECT DESCRIPTION:

A prerequisite for effective control of storm runoff pollution is a reliable method to predict the quantity of the storm runoff. The time distribution of storm runoff from an urban drainage system depends on the areal and temporal distributions of the intensity of the rainfall, the frequency of the rainstorm, and the physical characterictics of the drainage system. Numerous methods have been proposed to evaluate urban runoff from rainfall. Many have been accepted for engineering applications while others need yet to be tested and verified. The objective of the proposed investigation is to identify the best method or methods on the basis of the design as well as operational viewpoint and to recommend the selected method or methods to engineers for applications. This objective will be achieved by comparing the methods on a common basis by applying them to a selected urban drainage basin under identical rainstorms covering a sufficient range of rainfall intensity, duration, and frequency. Steep slope sewer hydraulics will also be investigated.

PROJECT TITLE: Development of a Hydrophobic Substance to Mitigate Pavement Ice Adhesion

EXTRAMURAL PROJECT DIRECTOR:

Harry C. Poehlmann
Ball Brothers Research Corp.
P. O. Box 1062
Boulder, Colorado 80302

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Div.

PROJECT NO.: 68-03-0359 (Contract)

PROGRAM ELEMENT: 1BB034

ROAP: 21ATB

EPA SUPPORT: $115,000

BEGINNING DATE: 1/74

COMPLETION DATE: 5/77

PROJECT DESCRIPTION:

The purpose of the study is to evaluate the relative merits of using these substances, once determined, as an alternate to the popular currently used deicing chlorides. The study shall be undertaken from the point of view of finding an economical hydrophobic anti-icing/deicing agent which can be placed on or within pavement surfaces (with lasting residual effectiveness and/or low cost of material and reapplication) and that would not have irreversible harmful effects on the environment.

While a specific substance which can fill pavement anti-icing/deicing requirements has not yet been identified, there are a number of existing compounds which should be tested before new research is begun. These compounds are all characterized by their ability to form a fairly strong bond to a surface while leaving no available bonds for water molecules, thus "repelling" any water that comes in contact with it. There are three major classes of compounds; Cationic Surface Active Agents, Organo-Flourochemical Compounds, and Organo Silicone Compounds. Fatty-quaternary-ammonium compounds, a subgroup of the first class listed above, might be particularly suitable. Such a compound, when dissolved in the proper solvent(s), could be sprayed on the road surface producing the desired film. This film would adhere to the road because the positively charged road surface. Although such a film would repel water its wearlife cannot be predicted easily without testing. A contract continuation will optimize the best substances and perform in situ testing in a northern climate.

PROJECT TITLE: Development of Methods to Separate Sediment from Storm Water Associated with Construction Operations

EXTRAMURAL PROJECT DIRECTOR:

Dr. J. F. Ripken
St. Anthony Falls Hydraulic Laboratory
Mississippi River @ Third Avenue, SE
Minneapolis, Minnesota 55414

MERL PROJECT OFFICER:

H. E. Masters
Wastewater Research Division

PROJECT NO.: R803579
PROGRAM ELEMENT: 1BB034
ROAP: 21ATB

EPA SUPPORT: $80,723

BEGINNING DATE: 4/75
COMPLETION DATE: 3/76

PROJECT DESCRIPTION:

The objectives of the study are to develop a technology to remove fine sediment from runoff from construction sites in a cost effective manner. This will be done in consecutive steps:

1. Review the literature and other ongoing studies.
2. Develop a pilot unit or a laboratory scale to test the most appropriate selected technique from Step 1, and
3. Demonstrate the technology at an appropriate field site.

PROJECT TITLE: Economic Analysis of Environmental Impact of Highway Deicing

EXTRAMURAL PROJECT DIRECTOR:	PROJECT NO.: 68-03-0442 (Contract)
Mr. Donald Murray ABT Associates, Inc. 55 Wheeler Street Cambridges, Massachusetts 02138	PROGRAM ELEMENT: 1BB034 ROAP: 21ATB EPA SUPPORT: $50,000
MERL PROJECT OFFICER:	BEGINNING DATE: 5/74
H. E. Masters Wastewater Research Division	COMPLETION DATE: 1/76

PROJECT DESCRIPTION:

This study involves an analysis of the cost of damages that result from the use of salt (sodium chloride and calcium chloride) on highways to melt snow and ice. A large literature search and several surveys were carried out in order to determine the types and extent of damages that have occurred.

An in-depth analysis was performed on all of the data obtained. The major cost sectors examined were: water supplies and health, vegetation, highway structures, vehicles, and utilities. For each of the sectors, a cost estimate was developed. The total annual national cost of salt related damage approaches $3 billion dollars or about 15 times the annual national cost for salt purchase and application. While the largest costs result from damage to vehicles, the most serious damage seems to be the pollution of water supplies and the degradation of health which may result. It is particularly difficult to assign costs in this latter area and therefore the estimate may substantially understate the actual indirect costs to society.

These findings indicate that the level of salt use should be reduced. The amount of the reduction should be determined on the basis of local conditions. A final report will be available shortly after the above completion date.

PROJECT TITLE: Evaluation of Stormwater Treatment Methods

EXTRAMURAL PROJECT DIRECTOR:	PROJECT NO.: 802535 (Grant)
Lawrence E. Kelley, President Minnehaha Creek Watershed District P. O. Box 387 Wayzata, Minnesota 55391	PROGRAM ELEMENT: 1BB034 ROAP: 21ATB EPA SUPPORT: $216,000
MERL PROJECT OFFICER:	BEGINNING DATE: 3/18/74
H. E. Masters Wastewater Research Div.	COMPLETION DATE: 9/76

PROJECT DESCRIPTION:

The proposed project will demonstrate the effectiveness of alternative methods of improving the quality of stormwater runoff from urban areas. An abandoned sewage treatment plant and a natural marsh area will be used to treat stormwater runoff to a degree that will make it acceptable for introduction to recreational water. Specifically, the following will be completed: 1) Evaluation of biological, geological and land use factors on the volume, rate and quality of the waters; 2) nutrient amounts defined according to season, storm intensity and duration: 3) feasibility and efficacy of stormwater treatment by sedimentation, various filtration processes and chlorination using the facilities of an abandoned sewage plant; 4) the ability of natural marshlands to improve the quality of stormwater runoff passing through; 5) the establishment of a nutrient budget for marshland soils and vegetation.

PROJECT TITLE: **Maximum Utilization of Water Resources in a Planned Community**

EXTRAMURAL PROJECT DIRECTOR:

W. G. Characklis
Rice University School of Engineering
6100 Main Street
Houston, Texas 77001

MERL PROJECT OFFICER:

R. I. Field
Wastewater Research Div.

PROJECT NO.: 802433 (Grant)
PROGRAM ELEMENT: 1BB034
ROAP: 21ATB

EPA SUPPORT: $161,000

BEGINNING DATE: 7/16/73
COMPLETION DATE: 6/30/76

PROJECT DESCRIPTION:

The project will be incorporated into a new community development and will be conducted on a 40 acre "pilot area". An 8 acre lake will be used as a scale model or "pilot lake" of a larger lake system for the community. Effluent from a pilot stormwater treatment plant will be pumped to the pilot lake at variable rates to simulate flows and detention times predicted for the larger lakes. The project is comprised of three basic areas: 1) Application and verification of EPA's SWMM for straight non-sewered urban runoff. 2) Piloting various stormwater treatment and control techniques, e.g., porous pavement, screening, swirl separation, high rate filtration, biological oxidation, carbon adsorption, chlorination/iodinization, and ozonation. 3) Establishing required treatment levels for pilot lakes. This project will develop and demonstrate an environmentally acceptable water management system for stormwater and dry-weather flows. The system will include reclamation of urban runoff for recreational and aesthetic purposes and dual dry and wet-weather flow treatment facilities. Thorough ecological effects of various biocides, nutrients, and disinfectant residuals in runoff will be measured. The important conservation philosophies of considering urban runoff as a benefit as opposed to a wastewater, along with the concept of community development which blends into the environment will be employed.

PROJECT TITLE: Nationwide Characterization, Impacts, and Critical Evaluation of Combined Sewer Overflow, Stormwater, and Non-Sewered Urban Runoff

EXTRAMURAL PROJECT DIRECTOR:

Richard H. Sullivan, General Manager
APWA Research Foundation
American Public Works Association
1313 East 60th Street
Chicago, Illinois 60637

MERL PROJECT OFFICER:

Richard Field
Wastewater Research Division

PROJECT NO.: 68-03-0283

PROGRAM ELEMENT: 1BB034

ROAP: 21ATB

EPA SUPPORT: $246,713

BEGINNING DATE: 6/73

COMPLETION DATE: 2/76

PROJECT DESCRIPTION:

A study of published and unpublished literature to develop an in-depth report on the quantity and quality characteristics and the pollutional significance of stormwater, non-sewered runoff, and CSO on a nation-wide scale will be conducted. The study area shall be broken down into local, state, regional and national segments to obtain a picture of maximum completeness in light of available information. An important outcome of the project will be the contractor's recommendations for strengthening the data bank in specific areas where information is sparse.

It is anticipated that the contractor will have computer capabilities and will be familiar with math modeling to the extent that handling storm-generated pollution from point and non-point sources will not present a significant problem. To the maximum possible extent, the methods of data presentation and reduction will be fully compatible with the EPA Stormwater Management Model (SWMM) or its modification. Potential use of the runoff/sewer section of the SWMM can be used to fill gaps and make more complete evaluations at specific geographic locations.

PROJECT TITLE: Nature/Impacts of Stormwater Pollution

EXTRAMURAL PROJECT DIRECTOR:

Donald A'Hern
Monumental Films & Recordings, Inc.
2160 Rockrose & Malden Avenues
Baltimore, Maryland 21211

MERL PROJECT OFFICER:

A. N. Tafuri
Wastewater Research Division

PROJECT NO.:

PROGRAM ELEMENT: 1BB034

ROAP: 21ATB

EPA SUPPORT: $40,000

BEGINNING DATE: 6/75

COMPLETION DATE: 6/76

PROJECT DESCRIPTION:

The purpose of this project is to develop a movie comparing the impacts of stormwater pollution to other forms of water pollution. The film will be addressed to engineers, decision-making officials and other individuals concerned with the wastewater management problem.

PROJECT TITLE: Standardize and Universalize Procedures for the Analysis/Evaluation of Stormwater and Combined Sewage

EXTRAMURAL PROJECT DIRECTOR:

C. Hansen
Envirex Inc., Environmental Sciences Div.
P. O. Box 2022
Milwaukee, Wisconsin

PROJECT NO.: 68-03-0335 (Contract)
PROGRAM ELEMENT: 1BB034
ROAP: 21ATB

EPA SUPPORT: $72,755

MERL PROJECT OFFICER:

Richard Field
Wastewater Research Division

BEGINNING DATE: 6/29/73
COMPLETION DATE: 2/15/76

PROJECT DESCRIPTION:

The objective of the project is to develop a set of standard procedures or methods to be used in the study of storm generated discharges. The procedures to be standardized include the following: sampling techniques, choice of quality characteristics, laboratory techniques, method of evaluating the severity of a discharge problem, and evaluation of treatment methods.

The project will be conducted by means of a thorough literature search of the subject, input from active organizations in this field, and calling upon the experience and knowledge of Envirex and the Storm and Combined Sewer Overflow Technology Branch of the U. S. Environmental Protection Agency. The final report from this project will be a manual for nationwide use which will allow for equal evaluation of all discharges, and prevent misinterpretation of data because of different characterization procedures.

PROJECT TITLE: Stormwater Treatment Facilities

EXTRAMURAL PROJECT DIRECTOR:

A. E. Holcomb
City of Dallas
500 South Ervay Street
Dallas, Texas 75201

MERL PROJECT OFFICER:

Richard Field
Wastewater Research Division

PROJECT NO.: 11023 FAW (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ATB

EPA SUPPORT: $1,093,360

BEGINNING DATE: 5/68

COMPLETION DATE: 1/76

PROJECT DESCRIPTION:

The objective of this project is to design, construct, and evaluate a facility to treat overflows from sewers carrying a mixture of domestic wastewater and infiltration stormwater. Physical features include a diversion structure, pumping station, flocculation and sedimentation basins, chemical feed facilities, and a pipeline for conveyance of waste lime sludge from the municipal water treatment plant to the overflow treatment facility. Treatment Unit No. 1 will include flocculation, sedimentation and polishing treatment with tube-type clarifiers; Unit No. 2 will include flocculation and sedimentation; Unit No. 3 will include high-rate sedimentation. Effluent from the facility will be chlorinated. Design flow rate will be 28 million gallons per day. The facility will be operated and evaluated as a demonstration project for a period of one year following completion of construction.

PROJECT TITLE: Urban Runoff Characteristics

EXTRAMURAL PROJECT DIRECTOR:

Dr. Herbert Preul
University of Cincinnati
Cincinnati, Ohio

MERL PROJECT OFFICER:

A. N. Tafuri
Wastewater Research Div.

PROJECT NO.: 11024 DQU (Grant)

PROGRAM ELEMENT: 1BB034

ROAP: 21ATB

EPA SUPPORT: $167,810

BEGINNING DATE: 6/29/70

COMPLETION DATE:

PROJECT DESCRIPTION:

The objectives of the first year of a three year research project to collect, for the first time, detailed information defining the physical characteristics of an urban drainage area tributary to a combined sewer drainage system and detailed data relating to the quantity and quality of various sources of pollution within the combined sewer drainage area has been successfully completed. Generally in the past, data have been collected only at the actual overflow location from a drainage area. The collection and evaluation of data from within the tributary drainage area will provide valuable insights regarding methods for controlling the strength and volume of combined sewer overflows.

The second year of the project concentrated on the verification and improvement of a basic mathematical model using the data collected as well as other available data.

A comprehensive stormwater management mathematical model has been developed for predicting the quantity and quality of combined sewer overflows. The detailed data collected were utilized for verification of this model. Communities needing a working tool for development of combined sewer overflow abatement programs will be able to utilize this model effectively. A final report is being prepared.

PROJECT TITLE: Urban Runoff Pollution From Motor Vehicles

EXTRAMURAL PROJECT DIRECTOR:

Gil Levin
Biospherics, Inc.
4928 Wyaconda Road
Rockville, Maryland 20852

MERL PROJECT OFFICER:

H. E. Masters

PROJECT NO.: 11030 GYJ (Contract)

PROGRAM ELEMENT: 1BB034

ROAP: 21ATB

EPA SUPPORT: $218,200

BEGINNING DATE: 4/24/72

COMPLETION DATE:

PROJECT DESCRIPTION:

The project is to provide first-line data on the specific contribution of motor vehicles to highway dust, dirt, solubles and other deposits, which eventually become pollutants in street stormwater runoff.

PROJECT TITLE: An Advanced Physical-Chemical Wastewater Treatment Process for the Housing & Community Development Industries

EXTRAMURAL PROJECT DIRECTOR:

Russel S. Bodwell, Vice President
Levitt & Sons, Inc.
A Subsidiary of Internatl. Telephone & Telegraph
Lake Success, NY 11040

MERL PROJECT OFFICER:

Irwin J. Kugelman
Wastewater Research Div.

PROJECT NO.: 11010 FVO (Contract)

PROGRAM ELEMENT: 1BB033

ROAP: 21 ASV

EPA SUPPORT: $310,000

BEGINNING DATE: 6/15/71

COMPLETION DATE: 1/1/76

PROJECT DESCRIPTION:

The objective of this project is to demonstrate the performance, economics, and applicability of a physical-chemical domestic wastewater treatment system designed to provide high quality discharges for isolated or developing communities having an average wastewater flow in the 25,000 to 500,000 gpd range.

The plant provides chemical clarification, magnetic filtration, activated carbon adsorption, and chlorination for the liquid stream. Sludges generated will be incinerated in a fluidized bed incinerator. This device will also be utilized for regenerating the activated carbon. All of the treatment equipment is housed in a structure similar to the frames of the houses in the subdivision. The treatment plant is on a standard subdivision lot, and has essentially no buffer zone.

The plant was dedicated in November 1972, and is now in its evaluation phase.

PROJECT TITLE: Conceptual Design, Process Performance, and Cost Analyses of Conventional and AWT Processes

EXTRAMURAL PROJECT DIRECTOR

Gordon, Culp, President, Project Director
Culp/Wesner/Culp
P. O. Box 40
El Dorado Hills, California 95630

MERL PROJECT OFFICER:

F. L. Evans
Wastewater Research Division, MERL

PROJECT NO.: 68-03-2186 (Contract)

PROGRAM ELEMENT: 1BB033

ROAP: 21-ASV

EPA SUPPORT: $415,600

BEGINNING DATE: 4/75

COMPLETION DATE: 4/77

PROJECT DESCRIPTION:

The project purpose is to provide capital and operating cost data for evaluating specific waste treatment alternatives; to determine electrical and other energy requirements for conventional and selected advanced waste treatment alternatives; and to determine the marketability of sewage sludge compost. The specific waste treatment alternatives for which capital and operating cost data are to be provided include filtration, coagulation/sedimentation, sludge transport, stormwater treatment, thermophillic aerobic digestion, and cost/effects from heat treatment of sludge. The approach will be to assimilate actual material and labor requirements from selected existing facilities, to determine capital costs, synthesize plant facilities for sizes not determined by actual construction records and to survey plants to determine manpower utility and miscellaneous requirements associated with operating the facilities.

Additional studies to be performed include energy use and conservation in municipal treatment plant design and operation, and an engineering evaluation and cost analyses of suspended and attached growth biological processes.

PROJECT TITLE: Demonstrate and Evaluate Physical-Chemical Treatment Train with NH_3-N Removal by Zeolite

EXTRAMURAL PROJECT DIRECTOR:

Dr. Walter Johnson
Metropolitan Waste Control Commission
of the Twin Cities Area
St. Paul, Minnesota

MERL PROJECT OFFICER:

F. L. Evans
Wastewater Research Division, MERL

PROJECT NO.: S802666 (Grant)

PROGRAM ELEMENT: 1BB033

ROAP: 21-ASV

EPA SUPPORT: $375,000

BEGINNING DATE: 6/1/75

COMPLETION DATE: 6/1/77

PROJECT DESCRIPTION:

The objective of this project is to conduct a detailed process, engineering and economic evaluation of an Independent Physical Chemical (IPC) Treatment Plant designed for high levels of removal of organics, suspended solids, nitrogen and phosphorus from domestic wastewater. The plant treatment train provides, in the following order, for chemical coagulation, sedimentation, filtration, granular activated carbon contacting, a second filtration step, ion exchange with an ammonia selective resin and chlorination. Performance of each unit process and unit operation will be evaluated under a variety of conditions. A number of combinations of treatment processes will be tested to determine the best system for the plant locality, however, the data will be applicable for use in other localities. Careful records of operation and maintenance will be kept in order to perform cost evaluations for this and other plants.

PROJECT TITLE: Lake Restoration by Phosphorus Control

EXTRAMURAL PROJECT DIRECTOR:

Dr. J. P. Grahek, Mayor
City of Ely
City Hall
Ely, Minnesota 55731

MERL PROJECT DIRECTOR:

R. M. Brice
Environmental Protection Agency
Shagawa Lake Restoration Project
222 West Conan Street
Ely, Minnesota 55731

PROJECT NO: S802309 (Grant)

PROGRAM ELEMENT: 1BB033

ROAP: 21-ASV

EPA SUPPORT: $2,716,858

BEGINNING DATE: 6/71

COMPLETION DATE: 1/77

PROJECT DESCRIPTION:

Shagawa Lake, which borders the City of Ely, Minnesota, and receives its wastewater discharge, is in a state of advanced eutrophy. The objective of this project is to demonstrate that removal of essentially all the phosphorus (residual phosphorus levels of <0.05 mg/l) from the City of Ely's municipal wastewater, in conjunction with efficient overall treatment, can restore a eutrophied lake.

The City's existing 1.5 mgd high rate trickling filter plant has been upgraded, septic tank drainage has been diverted to the treatment plant, and new tertiary wastewater treatment facilities following the existing City plant have been constructed. The 1.5 mgd tertiary facilities consists of flow equalization, two-stage lime clarification, dual-media filtration, and chlorination. Mixed primary/secondary sludge and chemical sludge are disposed of via gravity thickening, vacuum filtration and trucking to sanitary landfill.

PROJECT TITLE: Piscataway Model Advanced Waste Treatment Plant - A Joint Environmental Protection Agency and Washington Suburban Sanitary Commission Research Demonstration Project

EXTRAMURAL PROJECT DIRECTOR:

Dr. Alfred Machis
Washington Suburban Sanitary Commission
4017 Hamilton Street
Hyattsville, Maryland 20781

MERL PROJECT OFFICER:

T. P. O'Farrell
Office of Water & Hazardous Material Program

PROJECT NO: S802943 (Grant)

PROGRAM ELEMENT: 1BB033

ROAP: 21-ASV

EPA SUPPORT: $488,171

BEGINNING DATE: 5/72

COMPLETION DATE: 3/76

PROJECT DESCRIPTION:

This project provides the continuous operation of a 5 mgd model advanced waste treatment plant including two-stage lime precipitation, filtration, carbon adsorption, lime recalcination and carbon regeneration. The system is fed the effluent from a conventional activated sludge system, the main treatment plant being 30 mgd.

The operation of the model AWT plant will provide design data for the various unit processes and will determine the seasonal effects on the operation of the system. In addition, the operation will provide much-needed operational cost information.

PROJECT TITLE: Rancho Cordova Breakpoint Chlorination Demonstration

EXTRAMURAL PROJECT DIRECTOR:

W. S. Hyde, Division Chief
County of Sacramento
Department of Public Works
Sacramento, California

MERL PROJECT OFFICER:

F. L. Evans
Wastewater Research Division, MERL

PROJECT NO.: S803343 (Grant)

PROGRAM ELEMENT: 1BB033

ROAP: 21-ASV

EPA SUPPORT: $150,000

BEGINNING DATE: 8/1/74

COMPLETION DATE: 7/31/76

PROJECT DESCRIPTION:

The objective of this study is to demonstrate, on a full 2 mgd plant-scale basis, ammonia removal from activated sludge secondary effluent. The method proposed is: 1) the breakpoint chlorination of half of the effluent from the secondary clarifier; 2) blending of the chlorinated stream and the non-chlorinated stream after ten minutes chlorine contact time; 3) discharging the blended effluent into a holding pond having a detention time of 1-1/2 hours, and 4) dechlorination of the holding pond effluent with sulfur dioxide.

Further objectives of the project are to study the reaction kinetics, to evaluate process control strategies, and to evaluate the influence of process parameters on the unit process performance.

PROJECT TITLE: Demonstrate Improved Performance and Reliability of Selected Biological Treatment Plants (Western Area)

EXTRAMURAL PROJECT DIRECTOR:

Bob Hegg, Sanitary Engineer
M & I, Inc., Consulting Engineers
4710 South College Avenue
Fort Collins, Colorado 80521

MERL PROJECT OFFICER:

John M. Smith
Wastewater Research Division, MERL

PROJECT NO.: 68-03-2224 (Contract)

PROGRAM ELEMENT: 1BB033

ROAP: 21ASW

EPA SUPPORT: $204,741

BEGINNING DATE: 6/25/75

COMPLETION DATE: 6/24/77

PROJECT DESCRIPTION:

The project will be to perform a series of preliminary and intensive studies in the Western areas of the United States to document existing and improved performance of biological treatment plants as a function of the development and implementation of improved operation and maintenance practices. It is anticipated that 15 - 20 preliminary plant performance evaluation studies will be conducted per year. Following the preliminary plant evaluations, 2 - 4 plants per year will be selected for demonstration studies. The demonstration studies will require intensive monitoring of plant performance and will be conducted to provide a documented basis for improved performance through improved operation and maintenance practices. Individual reports on each of the studies will be developed as well as a final report summarizing the entire project.

PROJECT TITLE: Demonstration of Improved Performance and Reliability of Selected Biological Treatment Plants

EXTRAMURAL PROJECT DIRECTOR:

A. C. Gray, Project Engineer
Gannett Fleming Corddry and Carpenter, Inc
P. O. Box 1963
Harrisburg, Pennsylvania 17105

MERL PROJECT OFFICER:

John M. Smith
Wastewater Research Division, MERL

PROJECT NO.: 68-03-2223
PROGRAM ELEMENT: 1BB033
ROAP: 21ASW

EPA SUPPORT: $249,997

BEGINNING DATE: 6/25/75
COMPLETION DATE: 6/24/77

PROJECT DESCRIPTION:

The objective of the proposed project is to document the improved performance of selected biological treatment plants as a result of implementation of corrective operation and maintenance practices. A two-step approach will be used. The first step will be a detailed evaluation of operation and maintenance practices, and plant performance for 15 to 20 treatment plants. Such evaluation will be based upon existing data and additional sampling and analysis where required. A corrective operation and maintenance plan will be formulated for each case. The second step will consist of implementation of recommended improvements at four to six of the initial treatment plants studied, and monitoring of improved treatment. Cause and effect relationships between operation and maintenance factors and facility performance will be documented. For each of the four to six plants monitored an expanded case history will be prepared. Factors which contributed to improved performance and their relative degree of importance will be set forth. The above undertaking will be accomplished in twelve months, and repeated for a second series of previously unstudied treatment plants during the following twelve months.

PROJECT TITLE: Evaluate Effects of Flow Equalization on Two Existing Parallel Activated Sludge Plants

EXTRAMURAL PROJECT DIRECTOR:

J. G. Meenahan
Johnson & Anderson, INc.
P. O. Box 1066
2300 Dixie Highway
Pontiac, Michigan 48056

PROJECT NO: S801985 (Grant)

PROGRAM ELEMENT: 1BB033

ROAP: 21ASW

EPA SUPPORT: $163,891

MERL PROJECT OFFICER:

B. W. Lykins
Wastewater Research Division, MERL

BEGINNING DATE: 4/73

COMPLETION DATE: 6/76

PROJECT DESCRIPTION:

The objective of this project is to demonstrate and document the effects of equalizing the diurnal variation of flow volume and concentration on the year-round performance of two existing parallel activated sludge plants. The two treatment trains consist of a 4 mgd plant without primary treatment and a 4.5 mgd with primary treatment. Flow will be equalized to one plant while the second plant has unequalized flow. Comparison of data from the two plants will be made to determine the effects of flow equalization.

PROJECT TITLE: Evaluate Plant-Scale Flow Equalization Using In-Plant Aerators

EXTRAMURAL PROJECT DIRECTOR:

H. C. Grounds
Grounds & Associates
2177 St. Clair Avenue
St. Paul, Minnesota 55105

MERL PROJECT OFFICER:

B. W. Lykins
Wastewater Research Division, MERL:

PROJECT NO: S-803067-01-1 (Grant)

PROGRAM ELEMENT: 1BB033

ROAP: 21ASW

EPA SUPPORT: $94,083

BEGINNING DATE: 10/74

COMPLETION DATE: 3/76

PROJECT DESCRIPTION:

The existing 260,000 GPD Dawson, Minnesota activated sludge treatment plant utilizes the concept of flow equalization by varying the volume of a brush aerated oxidation ditch which is followed by a conventional horizontal flow constantly loaded final clarifier.

The objectives of this study are to: (1) evaluate suspended solids and BOD removal due to equalized flow, (2) optimize total nitrogen removal, (3) determine the annual operation and maintenance costs and (4) document the overall process applicability for providing high level secondary treatment for small communities.

PROJECT TITLE: Evaluation of Flow Equalization at the Walled Lake/Novi, Michigan Wastewater Treatment Plant

EXTRAMURAL PROJECT DIRECTOR:

J. G. Meenahan
Johnson & Anderson, Inc.
P. O. Box 1066
23oo Dixie Highway
Pontiac, Michigan 48056

PROJECT NO.: 68-03-0417 (Contract)

PROGRAM ELEMENT: 1BB033

ROAP: 21ASW

EPA SUPPORT: $14,217

MERL PROJECT OFFICER:

B. W. Lykins
Wastewater Research Division, MERL

BEGINNING DATE: 3/74

COMPLETION DATE: 1/76

PROJECT DESCRIPTION:

The objective of this project is to evaluate and document the impact of flow equalization on the 2.1 mgd activated sludge plant at Walled Lake/Novi, Michigan. Process streams will be characterized for a twelve-month period under equalized flow conditions with respect to BOD, total suspended solids and total phosphorus. The effects of the equalization basin on final settling and filtration will be evaluated by conducting two intensive week-long studies, one with and one without equalization of flow.

PROJECT TITLE: Transportable Advanced Wastewater Treatment Plant for Interim Use

EXTRAMURAL PROJECT DIRECTOR:

Joseph E. Sunday
Director, Department of Public Works
County of Fairfax
4100 Chainbridge Road
Fairfax, Virginia 22030

MERL PROJECT OFFICER:

Walter A. Feige
Office of Director, MERL

PROJECT NO.: 11010 GIT (Grant)

PROGRAM ELEMENT: 1BB033

ROAP: 21ASW

EPA SUPPORT: $97,820

BEGINNING DATE: 7/1/70

COMPLETION DATE: 9/7/75

PROJECT DESCRIPTION:

The objective of this project was to operate a transportable advanced waste treatment plant of approximately 75,000 gpd capacity that will satisfy the treatment efficiency recommended by the Potomac River Enforcement Conference for 1980 in Zone 1 of the River. However, extensive damage to the equipment and site took place on June 22, 1972 when Hurricane Agnes hit. As a result, the project was terminated. The facility was to have been operated for a 12-month period to evaluate its dependability, efficiency, operational characteristics, and its economics.

The approach to meet these strict effluent standards (5 mg/l BOD, 2.5 mg/l nitrogen, 0.2 mg/l phosphorus, and trace amounts of suspended solids) was to have been made through a combination of physical, chemical, and biological treatment. The planned treatment scheme was flow equalization, chemical clarification, biological nitrification (activated sludge), upflow columnar denitrification (with methanol), pressure filtration, and chlorination.

PROJECT TITLE: Interim Wastewater Treatment Plant Demonstration

EXTRAMURAL PROJECT DIRECTOR:

Paul W. Brown, General Manager
Sanitation District #1 of
Campbell & Kenton Counties
212 Greenup Street
Covington, Kentucky 41011

MERL PROJECT OFFICER:

J. F. Kreissl
Wastewater Research Div.

PROJECT NO.: 802719 (Grant)
PROGRAM ELEMENT: 1BB035
ROAP: 21ATC

EPA SUPPORT: $274,265.

BEGINNING DATE: 6/1/73

COMPLETION DATE: 3/31/77

PROJECT DESCRIPTION:

The objectives of this project are to design, fabricate and operate for a sufficient period a unique treatment system of a transportable nature to perform with high efficiency and flexibility for interim applications, such as a new housing development which will not receive adequate sewerage for a significant period of time. All aspects of the project will be documented in order to demonstrate the efficacy of the system for nationwide application.

The system, consisting of screening, chemical clarification, nitrification tower, filtration and carbon adsorption, will be fabricated after pilot-study determination of optimum design parameters. The system will be mounted on skids for transportability and operated through startup and routine stages. Certain specific studies will also be made to test the capabilities of the design.

PROJECT TITLE: Large Pressure Sewer Demonstration Project

EXTRAMURAL PROJECT DIRECTOR:

Mr. Gerald Hendricks
Sieco, Inc.
P. O. Box 407
Columbua, Indiana 47201

MERL PROJECT OFFICER:

J. F. Kreissel
Wastewater Research Div.

PROJECT NO.: 11050 DEU (Grant)
PROGRAM ELEMENT: 1BB035
ROAP: 21ATC

EPA SUPPORT: $254,290.

BEGINNING DATE: 7/1/69

COMPLETION DATE: 12/1/75

PROJECT DESCRIPTION:

The objectives of this project are to demonstrate that septic tank effluent can be treated by a combined anaerobic and aerobic lagoon without objectionable odors and show that the lagoon effluents containing nutrients can be converted to vegetation at reasonable costs, and to provide a community pressure sewer system that will demonstrate the volumetric reduction advantage in a tight pressure sewage system, the cost advantage of plastic pipe sewerage system, maintenance and power cost of grinding and pumping units by individual users.

The project has been completed.

PROJECT TITLE: Research and Demonstration Project on Vacuum and Pressure Sewers

EXTRAMURAL PROJECT DIRECTOR:	**PROJECT NO.:** S803295 (Grant)
	PROGRAM ELEMENT: 1BB035
Arthur R. Johnson City Manager P. O. Box 431 Bend, Oregon 97701	**ROAP:** 21ATC
	EPA SUPPORT: $150,000
MERL PROJECT OFFICER:	**BEGINNING DATE:** 6/15/74
James F. Kreissl Wastewater Research Div.	**COMPLETION DATE:** 6/30/77

PROJECT DESCRIPTION:

The primary difficulty encountered by the City of Bend in it's attempt to provide complete sewer service by 1980 is one of economics. Conventional sewers would be prohibitively expensive to the residents of the community, even with Federal assistance. Therefore, use of pressure and/or vacuum (See Figure 3) sewers presents an opportunity for considerable cost savings. These savings would accrue from the fact that such systems are laid to a depth dictated only by frost penetration, which in the Bend area is approximately 36 inches. In addition, these systems utilize small-diameter plastic sewer pipe which may be, laid in a manner which requires less time and effort, resulting in further cost savings. Another advantage of these systems is their "tightness," which essentially results in the elimination or minimization of infiltration. Reduced infiltration means that the hydraulic capacity of treatment and pumping facilities is reduced significantly on a flow per capita basis.

If either or both of these sewerage methods can be successfully demonstrated prior to the development of the plan to sewer the community, their use in many areas of the City has the potential to drastically reduce the overall cost of and minimize the disruption caused by sewering the community.

The proposed study entails the design, construction, and operation of parallel vacuum and pressure sewer systems, each serving from 10 to 20 homes, in an area where the construction of conventional gravity sewers is prohibitively expensive and potentially dangerous. The construction requirements and costs will be carefully documented and compared to similar information on gravity sewerage. The operation and maintenance needs will be documented and wastewater characterizations will also be made to provide further comparative data between these systems and with conventional systems.

PROJECT TITLE: Sewage Disposal by Evaporation-Transpiration

EXTRAMURAL PROJECT DIRECTOR:

Edwin R. Bennett, Associate Professor
Dept. of Civil & Environmental Engineering
University of Colorado
Boulder, Colorado 80302

MERL PROJECT OFFICER:

John W. Sheehy

PROJECT NO.: R-803871-01 (Grant)
PROGRAM ELEMENT: 1BB035
ROAP: 21ATC

EPA SUPPORT: $45,800

BEGINNING DATE: 7/1/75

COMPLETION DATE: 6/30/77

PROJECT DESCRIPTION:

Proper disposal of sewage effluent from rural and isolated homes and businesses is one of the most difficult problems facing health authorities. This is particularly true in areas where soil conditions are unsuitable for application of leaching fields following septic tanks. These conditions are in many areas having high ground water tables and in other areas where bedrock is close to the ground surface. Under these conditions, an evaporation type system concept can be used to dispose of the wastewater without adverse effects on the land or ground water.

The objectives of this study are to determine rational design criteria, estimated costs and potential applicability of evapotranspiration (ET) and mechanical evaporation (E) systems for disposal of wastewater from individual homes. Specific objectives are the quantification of major design parameters, such as soil type, saturated liquid depth and vegetative cover for ET systems and physical and mechanical factors for E systems, by thermodynamic studies, pilot studies, and in the case of ET systems, monitoring of existing full-scale systems. By use of meterologic and hydrologic data from approximately five locations in the United States, estimates of cost and applicability of these types of systems will be made for these locations, representing a wide spectrum of climatic conditions.

PROJECT TITLE: Small Scale Waste Management

EXTRAMURAL PROJECT DIRECTOR:

Prof. William C. Boyle
Dept. of Civil & Environmental Engineering
University of Wisconsin System
750 University Avenue
Madison, Wisconsin 53706

MERL PROJECT OFFICER:

J. F. Kreissl
Wastewater Research Div.

PROJECT NO.: 802874 (Grant)

PROGRAM ELEMENT: 1BB035

ROAP: 21ATC

EPA SUPPORT: $430,000

BEGINNING DATE: 12/17/73

COMPLETION DATE: 12/31/76

PROJECT DESCRIPTION:

This project will study and evaluate systems to be used for on-site treatment and disposal of liquid wastes produced in homes not connected to a municipal sewerage system. Studies on treatment will include evaluation of the traditional septic tank and of several mechanical units using aerobic or chemical treatment procedures. Disposal and associated treatment will be studied in soil occurring as a mound on top of the original soil or in traditional subsurface seepage beds with various techniques of application. The degree of treatment in any system will be monitored by an interdisciplinary team of sanitary engineers, soil chemists and physicists, bacteriologists and virologists. Studies include laboratory and full-scale field monitoring of treatment and disposal systems. Biological and biochemical studies are planned to study mechanisms of soil clogging. Institutional studies are planned to study implications resulting from the introduction of new technology.

PROJECT TITLE: Vacuum Collection of Sewage and Septage Management Study

EXTRAMURAL PROJECT DIRECTOR:

Mr. Joseph W. Rezek
Rezek, Henry, Meisenheimer & Gende, Inc.
162 E. Cook Ave.
Libertyville, Illinois 60048

MERL PROJECT OFFICER:

J. F. Kreissl
Wastewater Research Division, MERL

PROJECT NO: 68-03-2231 (Contract)

PROGRAM ELEMENT: 1BB035

ROAP: 21-ATC

EPA SUPPORT: $100,000

BEGINNING DATE: 7/23/75

COMPLETION DATE: 10/23/76

PROJECT DESCRIPTION:

In both cases--septage treatment and disposal and vacuum sewage collection--a standard of engineering practice has not yet emerged. In view of the need to provide smaller communities with low cost solutions to problems associated with wastewater control, there is a need to provide these communities with more definite information on methodologies for handling septage and evaluating the potential of vacuum sewage systems. Likewise, regulatory agencies and consulting engineers need to define bases for evaluating and designing cost-effective alternatives in each area.

Therefore, this proposal addresses both of these problem areas in order to provide information to Federal, State and local regulatory agencies, and consulting engineers so that these problems can be dealt with in a more orderly and comprehensive manner. It is expected that the results of this study program will be used in the following way:

1) Smaller communities will be provided with a basis for evaluating alternatives.

2) Consulting engineers will be provided with data and information whereby cost-effective designs can be formulated.

3) Regulatory agencies will be provided with information upon which regulations, policies and programs may be based.

PROJECT TITLE: Water Reclamation Project for Antelope Valley

EXTRAMURAL PROJECT DIRECTOR:

Sanitation Division Engineer
County of Los Angeles
Department of County Engineer
108 West Second Street
Los Angeles, California 90012

MERL PROJECT OFFICER:

John N. English
Wastewater Research Division

PROJECT NO.: 17080 GCI (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21-ACQ

EPA SUPPORT: $271,760

BEGINNING DATE:

COMPLETION DATE:

PROJECT DESCRIPTION:

The objectives of this project are to enable engineers and scientists to conduct continuing studies under actual "full-scale" operational conditions of a wastewater reclamation project in Antelope Valley; to demonstrate that sufficient algae and nutrient removal can be realized to prevent excess biological growth, and to maintain aesthetic levels of clarity, and to assure an adequate habitat for fish life in recreational lakes; to ensure safe degree of enteric pathogen and virus destruction to permit safe use of reclaimed wastewater; to provide controls for any insect or noxious plant problems which occur in conjunction with such projects; to develop a "Manual of Practices" that would have widespread application in the field of wastewater reclamation; and to demonstrate the acceptability by the public of the use of reclaimed wastewater for establishing attractive aquatic recreational facilities, especially in water short desert areas.

PROJECT TITLE: Advanced Waste Treatment for Water Reclamation and Reuse by Injection

EXTRAMURAL PROJECT DIRECTOR:

Herbert J. Simons
Commissioner of Public Works, Nassau County
Mineola, NY 11501

MERL PROJECT OFFICER:

Irwin J. Kugelman
Wastewater Research Division

PROJECT NO.: 17080 FAF (Grant)
PROGRAM ELEMENT: 1BB043
ROAP: 21ASB

EPA SUPPORT: $2,553,200

BEGINNING DATE: 12/31/66

COMPLETION DATE: 3/1/76

PROJECT DESCRIPTION:

The objectives of this project are to conduct studies of advanced waste treatment processes and to demonstrate that the reclaimed secondary effluent is suitable for reuse and injection into underground aquifers. This project will provide operating data on advanced waste treatment processes and allow optimizing the economics of the process. It will also demonstrate the effectiveness and reliability of advanced waste treatment as a method of providing water for reuse from secondary treatment plant effluent.

PROJECT TITLE: Blue Plains Pilot Plant: Operation and Evaluation of a Wastewater Reuse Pilot Plant

EXTRAMURAL PROJECT DIRECTOR:

Allan Cassel
Department of Environmental Services
Government of the District of Columbia
415 - 12th Street, N. W.
Washington, DC 20004

MERL PROJECT OFFICER:

Irwin J. Kugelman
Wastewater Research Division, MERL

PROJECT NO.: 68-01-0162
PROGRAM ELEMENT: 1BB043
ROAP: 21ASB

EPA SUPPORT: $107,142

BEGINNING DATE: 6/74
COMPLETION DATE: 6/77

PROJECT DESCRIPTION:

The treatment system to produce a high quality water potentially suitable for potable reuse consists of lime clarification followed by biological nitrification, downflow packed bed biological denitrification, carbon adsorbtion, filtration, disinfection and ion exchange. Analysis for over 50 constituents will be conducted on a routine basis to establish the acceptability of the effluent for reuse. In addition, standard pollution control parameters such as BOD, COD and etc. will be measured. Specialized analysis for organics in the effluent utilizing Gas Chromatography, Liquid Chromatography, and G.C.-Mass Spectroscopy are planned.

PROJECT TITLE: Characterization for Potable Reuse and Ultraviolet Disinfection of Municipal Effluent

EXTRAMURAL PROJECT DIRECTOR:	PROJECT NO.: R-803292 (Grant)
Henry J. Graeser, Director Dallas Water Utilities Dept. 500 S. Ervay Dallas, Texas 75201	PROGRAM ELEMENT: 1BB043 ROAP: 21-ASB EPA SUPPORT: $71,801
MERL PROJECT OFFICERS:	BEGINNING DATE: 6/1/74
Albert D. Venosa John N. English Wastewater Research Division, MERL	COMPLETION DATE: 12/30/76

PROJECT DESCRIPTION:

The Dallas Advanced Wastewater Treatment (AWT) Pilot Plant (100 GPM) will be continuously and reliably operated to produce a high quality effluent. Plant performance will be evaluated with respect to parameters of potable water quality, and special animal virus studies will be conducted to determine the effectiveness of the pilot processes (nitrification, high pH lime clarification, filtration, and carbon adsorption) in the removal of virus and other pollutants adversely affecting the reuse potential of the effluent for potable and non-potable purposes. In addition to the efforts conducted by the pilot plant staff, special samples of effluent will be concentrated and the organics captured by an EPA contractor for subsequent EPA animal toxicity studies.

The AWT pilot plant will also be used to conduct a feasibility study of ultraviolet (UV) light disinfection of 2 types of activated sludge effluents. (1) a nitrified effluent; and, (2) a standard high rate effluent. Both effluents will be tested with and without tertiary settling, chemical addition, and filtration. The results of the investigation will define the potential role of UV light disinfection of wastewater.

PROJECT TITLE: Economic Analyses of Water Supply Systems to Evaluate Relationships Between Cost of Developing New Water Supplies and Wastewater Renovation for Potable Reuse

EXTRAMURAL PROJECT DIRECTOR:

James I. Gillean
ACT Systems, Inc.
807 W. Morse Blvd.
Winter Park, Florida 32789

MERL PROJECT OFFICER:

Robert Clark
Water Supply Research Division, MERL

PROJECT NO.: 68-03-2071 (Contract)

PROJECT ELEMENT: 1BB043

ROAP: 21-ASB

EPA SUPPORT: $62,000

BEGINNING DATE: 6/30/74

COMPLETION DATE: 10/30/76

PROJECT DESCRIPTION:

The purpose of this contract is to define what the constraints of supply are, and how they might be changed to make renovated wastewater a reasonable alternative for supply. To accomplish this goal, data will be collected from water utilities in selected metropolitan areas in an attempt to provide insight into some of the complex problems associated with water supply. Information will be collected concerning the total operations of a selected sample of water utilities in an attempt to provide base-line information against which the potential for wastewater reuse as an alternative for current water supplies can be addressed. This is a cooperative effort with the MERL Wastewater Research Division (WRD). John English is the WRD contact.

PROJECT TITLE: Evaluation of Full Scale Wastewater Reuse System for Domestic Groundwater Replenishment

EXTRAMURAL PROJECT DIRECTOR:

David Argo
Orange County Water District
P. O. Box 8300
Fountain Valley, California 92708

MERL PROJECT DIRECTOR:

John N. English
Wastewater Research Division, MERL

PROJECT NO.: S803873 (Grant)

Program Element: 1BB043

ROAP: 21-ASB

EPA SUPPORT: $95,000

BEGINNING DATE: 9/1/75

COMPLETION DATE: 8/31/78

PROJECT DESCRIPTION:

The objectives of this study are to evaluate on a full plant-scale basis: (1) the reliability and effluent variability of a 15 mgd advanced wastewater treatment (AWT) system producing a water approaching potable quality for use in groundwater replenishment and prevention of seawater intrusion, and (2) the quality of the effluent with regard to the identification measurement, and monitoring of trace materials (chemical, physical and biological) and residues. Particular emphasis will be placed on the characterization of the organic materials in the effluent using the latest gas chromatographic/mass spectrophotometric procedures.

The AWT system treats the effluent from a trickling filter plant using lime coagulation and sedimentation, ammonia stripping, recarbonation, filtration, carbon adsorption, and chlorination. This effluent will be blended with desalted seawater and/or a supply of deep groundwater for injection into a domestic aquifer.

PROJECT TITLE: Evaluation of Reuse Potential of Water Supply Systems

EXTRAMURAL PROJECT DIRECTOR:

A C T Systems Inc.
807 W. Morse Blvd.
Winter Park, Florida 32789

MERL PROJECT OFFICER:

J. N. English
Wastewater Research Division

PROJECT NO.: 68-03-2071 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASB

EPA SUPPORT: $57,240

BEGINNING DATE: 7/73

COMPLETION DATE: 6/74

PROJECT DESCRIPTION:

Little organized data is available concerning the financing and operating characteristics and the relative economics of water supply utility management. The effort which has been undertaken as part of this contract will collect data in a standardized and comparable form from one major water supply utility in each of the ten EPA regions. The data will help to define the factors which influence the cost of water supply and will also be useful in assessing the relative cost of rennovated wastewater as a alternative source for water supply.

PROJECT TITLE: Measurement Parameters of Potable Water Quality Including Concentration of Organics for Health Effects Testing in Effluents from AWT Systems

EXTRAMURAL PROJECT DIRECTOR:

James K. Smith
Gulf South Research Institute
8000 GSRI Avenue
Baton Rouge, LA 70809

MERL PROJECT OFFICER:

John W. English
Wastewater Research Division

PROJECT No.: 68-03-2090 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21-ASB

EPA SUPPORT: $176,562

BEGINNING DATE: 6-25-74

COMPLETION DATE: 6-24-76

PROJECT DESCRIPTION:

The objectives of the project include the following:

(a) to continue research on membrane technology as they become commercially available; (b) to collect concentrated samples of organic contaminants from seven AWT plants located in California, Texas, and Washington, D.C. that are producing effluents approaching potable water quality for use in health effects testing; (c) to evaluate techniques used in this sample collection and suggest optimal procedures for future sample collection and concentration of organics from waters produced by AWT plants; and, (d) to survey the 7 AWT plants on a routine basis for parameters of potable water quality by measuring microbiological, organic, and inorganic pollutants that can be hazardous to health if ingested in sufficient quantities. This project is a cooperative effort with the Health Effects Research Laboratory and Dr. F. C. Kopfler is co-Project Officer.

PROJECT TITLE: Nutrient Removal Utilizing Activated Sludge Phosphate Adsorption and Microbial Denitrification

EXTRAMURAL PROJECT DIRECTOR:

Lloyd C. Coffelt
Irvine Ranch Water District
P. O. Box D-1, 4201 Campus Drive
Irvine, California 92664

MERL PROJECT OFFICER:

Gerald Stern

PROJECT NO.: 17080 EDW

PROGRAM ELEMENT: 1BB043

ROAP: 21ASB

EPA SUPPORT: $325,500

BEGINNING DATE: 1/31/67

COMPLETION DATE: 4/1/76

PROJECT DESCRIPTION:

Objective: To demonstrate nutrient removal for reclamation of wastewater. Approach: A 0.26 MGD (pilot scale) nutrient removal wastewater treatment facility was constructed and operated for 12 months. The major steps involved were: (a) phosphate incorporation into biological sludge and nitrification in an aeration basin: (b) sludge-liquid separation by either vibrating screens and/or dissolved air flotation; (c) the liquid phase is treated for nitrogen removal (denitrification) in an upflow sand filter with methanol addition as organic food source; (d) the concentrated sludge (2% to 3%) from the vibration screens and/or dissolved air flotation is treated with acid (sulfuric) to reduce the pH to around 5. At this pH the phosphate in the sludge is solubilized; (3) the phosphate laden liquid phase is separated from the solid (sludge) phase by co-current solid bowl centrifugation. The phosphate free sludge is recycled to the aeration basin. Thus mechanical separation is used to separate the liquid and concentrate the sludges as quickly as feasible to avoid biological sludge deterioration. Progress: (a) Dissolved air flotation is a very effective process for separating mixed liquor. The flotate (sludge solid phase) can be concentrated to 3% solids; (b) Up flow sand filtration provides an excellent media, with methanol addition, for denitrification. Care must be taken to avoid solids breakthrough by nitrogen gas bubbles; (c) The combination of nitrification in the aeration basin, dissolved air flotation for solids-liquid separation, and adding methanol as organic food source to the liquid influent feed to the upflow sand filter, results in up to 95% nitrogen removal; (d) Vibrating screens are not an effective separating device for mixed liquors; (e) Phosphate removal could not be demonstrated because of the ineffectiveness of the co-current solid bowl centrifuge to separate the phosphate laden liquid from the sludge. Solids losses in the centrate were excessive; (f) A final report is being prepared.

PROJECT TITLE: Workshop on Research Needs in Wastewater Renovation and Reuse

EXTRAMURAL PROJECT DIRECTOR:	**PROJECT NO.:** R-803546 (Grant)
Dr. Edwin R. Bennett Associate Professor Department of Civil & Environmental Engineering University of Colorado Boulder, Colorado 80302	**PROGRAM ELEMENT:** 1BB043 **ROAP:** 21ASB **EPA SUPPORT:** $11,710
MERL PROJECT OFFICER:	
John N. English Wastewater Research Division	**BEGINNING DATE:** 12/1/74 **COMPLETION DATE:** 10/31/75

PROJECT DESCRIPTION:

The objective of the workshop is to define and establish priorities for research needed to develop confidence in the reuse of wastewater for potable purposes. This objective will be accomplished by bringing together 100 select persons concerned with wastewater reuse to discuss and identify research gaps in the areas of health effects, treatment technology, and the socio-economic considerations of potable reuse. This identified research will serve as a basis for future EPA projects.

The workshop will be jointly sponsored by the Environmental Protection Agency (EPA), the Water Pollution Control Federation (WPCF), the American Water Works Association (AWWA), and is being held in cooperation with the University of Colorado in March 1975, at the Boulder, Colorado campus.

PROJECT TITLE: Activated Sludge Process Control Using TOC, ATP, and Oxygen Uptake as Control Parameters

EXTRAMURAL PROJECT DIRECTOR:

Tom Laib, Chief Chemist
City of Hillsboro, Oregon
770 South First Avenue
Hillsboro, Oregon 97123

MERL PROJECT OFFICER:

J. F. Roesler
Wastewater Research Division

PROJECT NO.: R802983

PROGRAM ELEMENT: 1BB043

ROAP: 21-ASC

EPA SUPPORT: $16,280

BEGINNING DATE: 7/25/74

COMPLETION DATE: 1/24/76

PROJECT DESCRIPTION:

Three variables, total organic carbon (TOC), adenosine triphosphate (ATP) and oxygen demand or uptake (OD), are continually being suggested for application to automatic control of a wastewater treatment plant. At Hillsboro, Oregon, the first objective of the project is to demonstrate the use of the above three variables for control of the activated sludge process. Further objectives of the project are to demonstrate the use of an adjustable aerator volume for changing the mode of operation and to demonstrate the use of a modified food to microorganism (F/M) ratio as the basis of a control strategy. Both TOC and ATP will be used as parameters in the F/M ratio.

Analysis of possible modes of operation and application of control strategies at Hillsboro should provide general insights into operation and control of the activated sludge process.

PROJECT TITLE: For the Automatic Control of Dissolved Oxygen in the Activated Sludge Process Documentation of the Design and Operation of Various Alternatives

EXTRAMURAL PROJECT DIRECTOR:

Brian D. Bracken
Brown & Caldwell
1501 North Broadway
Walnut Creek, California 94596

MERL PROJECT OFFICER:

J. F. Roesler
Wastewater Research Division

PROJECT NO.: 68-03-2130 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASC

EPA SUPPORT: $51,000

BEGINNING DATE: 6/28/74

COMPLETION DATE: 12/28/75

PROJECT DESCRIPTION:

The purpose of this work is to present, in written form a recommended design procedure to guide the design engineer in the selection of aeration equipment and control techniques for achieving optimal dissolved oxygen control for the activated sludge process. The design procedure will include the concepts of effectiveness, cost, reliability, operating, and maintenance aspects associated with diffused air and mechanical aeration controlled to hold the dissolved oxygen set point at some specified level.

PROJECT TITLE: Automation of Physical-Chemical Treatment Systems

EXTRAMURAL PROJECT DIRECTOR:

Robert B. Yarrington
Dept. of Environmental Services
Government of the District of Columbia

MERL PROJECT OFFICER:

D. F. Bishop

PROJECT NO.: 68-01-0162 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASC

EPA SUPPORT: $191,000

BEGINNING DATE: 6/72

COMPLETION DATE: 6/74

PROJECT DESCRIPTION:

The objectives are to develop digital control algorithms for physical-chemical treatment of raw wastewater, to evaluate these control algorithms with an IBM System 7 process control computer on the pilot physical-chemical treatment system and to evaluate an analog control system in the three-stage activated sludge treatment in the EPA-DC Pilot Plant. Closed and open loop analog response data developed by the EPA on an existing analog control system is being used by the District of Columbia and IBM to develop digital control algorithms for four feed-forward feed-back control loops and three feed-forward loops in the physical-chemical system. The feed-forward feed-back control loops are flow-proportional pH-error control of lime and CO_2 in lime treatment, and CL_2 in pH reduction, and, in breakpoint chlorination, mass-proportional Cl_2 and mass-proportional pH-error control of NaOH.

The feed-forward loops are flow-proportional control of $FeCl_3$ and sludge wasting in the two-stage lime treatment process. To date, the control algorithms have been developed and confirmed by IBM with simulation techniques. The system 7 computer is installed and on-line evaluation of the control systems is proceeding. The evaluation of the analog control system in the three-stage activated sludge system is beginning and will be used in a later study to develop digital control of portions of the three-stage activated sludge system.

PROJECT TITLE: Blue Plains Pilot Plant: Automation of Biological Process Streams

EXTRAMURAL PROJECT DIRECTOR

Allan Cassel
Department of Environmental Services
Government of the District of Columbia
415 - 12th Street, N. W.
Washington, DC 20004

MERL PROJECT OFFICER:

Irwin J. Kugelman
Wastewater Research Division, MERL

PROJECT NO.: 68-01-0162

PROGRAM ELEMENT: 1BB043

ROAP: 21ASC

EPA SUPPORT: $62,855

BEGINNING DATE: 10/1/74

COMPLETION DATE: 4/1/77

PROJECT DESCRIPTION:

To develop control loops for and evaluate the efficacy of automation of activated sludge systems. Strategies will concentrate on control of F/M, SRT, D.O. and sludge inventory. Strategies will be evaluated for steady state and transient conditions. Digital and analog control equipment will be evaluated.

PROJECT TITLE: Development of an Automatic On-Line Wastewater Sample Transfer and Conditioning System

EXTRAMURAL PROJECT DIRECTOR:

Mr. Louis S. DiCola,
Mechanical Design Engineer
Raytheon Company
Environmental Systems Center
Portsmouth, RI 02871

MERL PROJECT OFFICER:

R. H. Wise
Wastewater Research Division

PROJECT NO.: 68-03-0262 (Contract)
PROGRAM ELEMENT: 1BB043
ROAP: 21-ASC

EPA SUPPORT: $128,191

BEGINNING DATE: 6/11/73

COMPLETION DATE: 3/1/76

PROJECT DESCRIPTION:

The objective of this project is to develop or furnish an on-line hardware system which will automatically sample, blend, transfer and condition all types of wastewater-treatment process streams for automatic analyses (such as those for total organic carbon, phosphorus, nitrate, nitrite and ammonia) without the occurrence of unacceptable chemical changes in the sample prior to its analysis. Such sample conditioning will include secondary blending, dilution, and/or filtration where any one or combination of these operations is required.

PROJECT TITLE: Digital Automation of the Three-Stage Activated Sludge System

EXTRAMURAL PROJECT DIRECTOR:

Robert B. Yarrington
Dept. of Environmental Services
Government of the District of Columbia

MERL PROJECT OFFICER:

Dr. I. J. Kugelman

PROJECT NO.: 68-01-0162

PROGRAM ELEMENT: 1BB043

ROAP: 21ASC

EPA SUPPORT: $153,000

BEGINNING DATE: 10/1/72

COMPLETION DATE: 6/75

PROJECT DESCRIPTION:

The objectives are (1) to develop digital control algorithms needed in the three-stage (BOD, nitrification, denitrification) activated sludge for process control; (2) to evaluate these control algorithms with an IBM system 7 process control computer on the three-stage activated sludge pilot system at the EPA-DC Pilot Plant; and (3) to develop digital data acquisition programs for the three-stage activated sludge system. The three-stage activated sludge system consists of an activated sludge stage with mineral addition (alum or $FeCl_3$) for BOD and phosphorus removal, nitrification and denitrification with methanol and mineral addition for nitrogen and residual phosphorus removal, and filtration for residual solids removal. The control loops for chemical feed of methanol or minerals (alum, or $FeCl_3$) are mass- (P or NO_3^-) - proportional feed-forward systems; for sludge wasting, flow-proportional feed-forward systems, for D.O. control, a complex feed-forward feed-back system based on flow, and recycle, D.O. uptake rate, oxygen transfer efficiency, and D.O. error deviation from set point. Any F/M control will require sensor evaluation and analog development.

PROJECT TITLE: State-of-the-Art Report on Instrumentation and Control in Wastewater Systems and Treatment Plants

EXTRAMURAL PROJECT DIRECTOR:

Mr. Robert Day
Senior Environmental Engineer
Environmental Systems Center
Raytheon Company
Box 360
Portsmouth, RI 02871

MERL PROJECT OFFICER:

Joseph F. Roesler
Wastewater Research Division

PROJECT NO.: 68-03-0144 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASC

EPA SUPPORT: $158,000

BEGINNING DATE: 6/30/72

COMPLETION DATE: 3/1/76

PROJECT DESCRIPTION:

The objectives of this project are to: survey the literature; survey the user experience of instrumentation and control systems and determine the performance of instrumentation in the field; design alternative control strategies for each wastewater treatment unit process; prepare a plant layout for a hypothetical 1 and 10 mgd facility; estimate the costs incurred, benefits derived and operating problems associated with actual or proposed process control schemes; and identify future research needs.

PROJECT TITLE: State-of-the-Art Technology for Semi-Automatic Control of Activated Sludge Treatment Plants

EXTRAMURAL PROJECT DIRECTOR:

Carl Nagel
Superintendent of Treatment
P. O. Box 4998
Whittier, California 90607

MERL PROJECT OFFICER:

R. Smith
Wastewater Research Division

PROJECT NO.: 803055 (Grant)
PROGRAM ELEMENT: 1BB043
ROAP: 21-ASC

EPA SUPPORT: $9,213

BEGINNING DATE: 6/01/74
COMPLETION DATE: 03/31/75

PROJECT DESCRIPTION:

The objectives of the project are:

(a) to document the theory, design and operation of continuous on-line instrumentation currently in use by LACSD,

(b) to document the computer applications LASCD is using to assist the operator in calculating the daily operational parameters necessary for the semi-automatic control of seven waste treatment plants, and

(c) to develop additional computer software to give the operator additional information on the status of the plant operations.

Five processes which are using automatic or semi-automatic control will be explored or documented. These processes are: influent pumping (level control), primary sludge pumping (density control), activated sludge aeration (process air control), activated sludge wasting (sludge flow control), and sludge return (sludge flow control). Seven facilities are involved and a time sharing computer will be employed at each plant. The computer will calculate the operating parameters and also assess the effluent quality with reference to mean or median limits.

PROJECT TITLE: Workshop on Research Needs in Automation of Wastewater Treatment Systems

EXTRAMURAL PROJECT DIRECTOR:	PROJECT NO.: 803214 (Grant)
Professor John F. Andrews Principal Investigator Environmental Systems Engineering Dept. Clemson University Clemson, South Carolina 29631	PROGRAM ELEMENT: 1BB043 ROAP: 21-ASC EPA SUPPORT: $3,000
MERL PROJECT OFFICER: J. Roesler Wastewater Research Division	BEGINNING DATE: 7/11/74 COMPLETION DATE: 6/30/75

PROJECT DESCRIPTION:

The primary objective of the workshop will be to define and establish priorities for research needed to automate wastewater treatment plants. However, since the input to a plant comes from a collection system and the output is normally discharged to a receiving body of water, attention will also be devoted to research needs for these systems with special reference to their interaction with treatment plants. Also addressed will be the effect of automation on design and operation of wastewater recycle systems.

The workshop will be three days in length with the first day being devoted to the presentation and discussion of state-of-the-art papers. Six separate workshop sessions will then be devoted to preparation of brief documents stating the problems and specifying needed research for each session topic. These documents will then be presented to the reassembled group for detailed discussion. The final day will be devoted to a tour of a new 120 MGD activated sludge plant which is highly automated and features on-line computer control. This tour will afford participants the opportunity to observe first hand the state-of-the-art of automation and problems which need to be solved.

The proceedings of the workshop, including the discussions will be published under the title "Research Needs in the Automation of Wastewater Treatment Systems."

PROJECT TITLE: Capillary Sludge Dewatering

EXTRAMURAL PROJECT DIRECTOR:

City of Saint Charles, Illinois
2-10 East Main Street
St. Charles, Illinois 60174
Mr. Arthur N. Kay

MERL PROJECT OFFICER:

Dr. J. E. Smith, Jr.

PROJECT NO.: 802693
PROGRAM ELEMENT: 1BB043
ROAP: 21ASD

EPA SUPPORT: $189,677

BEGINNING DATE: 7/16/73

COMPLETION DATE: 6/30/78

PROJECT DESCRIPTION:

By demonstrating on a plant scale the dewatering of waste activated and other sludges with the Capillary Dewatering Device, this study seeks to confirm on a sound statistical basis and further improve the favorable results obtained on the pilot capillary sludge dewatering device developed under EPA Contract No. 68-01-0094 (17070 HCZ). Specific objectives are to determine: (1) the effect of scale-up on system engineering parameter performance and mechanical requirements, (2) system reliability from a process and mechanical standpoint, and (3) an economic basis for system evaluation. The period of the study will be twenty four months. It is expected that the capillary device will attain higher filter yields and lower cake moistures and that the sewage will require less chemical conditioning than has heretofore been possible with existing dewatering equipment. Dewatering effectiveness will be measured by (1) sludge cake output or yield, (2) sludge cake characteristics, (3) solids removal efficiency, (4) liquid process stream quality, (5) conditioning chemical usage, and (6) cost of dewatering.

PROJECT TITLE: Chemical Sewage Sludge Thickening and Dewatering

EXTRAMURAL PROJECT DIRECTOR:

Dr. David DiGregorio
Envirotech Corp., Eimco Div.
Box 300
Salt Lake City, Utah 84110

MERL PROJECT OFFICER:

R. V. Villiers

PROJECT NO.: 68-03-0404 (Contract)
PROGRAM ELEMENT: 1BB043
ROAP: 21ASD

EPA SUPPORT: $182,000

BEGINNING DATE: 4/1/74

COMPLETION DATE: 6/1/75

PROJECT DESCRIPTION:

A side-by-side comparison of the thickening and mechanical dewatering characteristics of phosphorus-laden alum-primary and iron-primary sludges. Information obtained will be used to prepare guidelines for the best method of handling, processing and disposing of these types of sludges.

PROJECT TITLE: Co-Incineration of Sewage Sludge with Refuse and/or Coal

EXTRAMURAL PROJECT DIRECTOR:

Metropolitan Waste Control Commission
of Twin Cities Area
350 Metro Square Bldg.
St. Paul, Minnesota
Mr. Dale Bergstedt

MERL PROJECT OFFICER:

R. A. Olexsey

PROJECT NO.: 803927 (Grant)
PROGRAM ELEMENT: 1BB043
ROAP: 21ASD

EPA SUPPORT: $371,021

BEGINNING DATE: 7/1/75

COMPLETION DATE: 6/30/77

PROJECT DESCRIPTION:

Purpose of the project is to evaluate the operational worth and environmental aspects, if any, of adding combustible solid matter to wastewater plant sludges and filter cakes, as off-sets to part or all of the fuels conventionally used in sludge incineration practice. Impending shortages of natural gas and fuel oil create the sense of urgency in this work. Low-sulfur coal and combustible solid wastes will be utilized as admix materials in various test sequences. Wastes to be tried include shredded combustibles from refuse, in pelletized and loose form, wood chips from urban tree-trimming, shredded tires, and industrial combustible wastes. A full-scale multiple hearth furnace in a modern wastewater treatment plant will be used. Applicability to other incinerators of the 200-plus total in United States' communities will be assessed. Assay of stack gases, after scrubbing, will include relevant chemical properties of public health significance. Scrubber drainage and ash will also be assayed.

PROJECT TITLE: Engineering Design and Cost Parameters for Lime Treatment and Sludge Disposal, Recovery and Reuse

EXTRAMURAL PROJECT DIRECTOR:

Dr. Denny S. Parker
Brown & Caldwell Consulting Engineers
66 Mint Street
San Francisco, California 94103

MERL PROJECT OFFICER:

Dr. J. E. Smith, Jr.

PROJECT NO.: 68-03-0334
PROGRAM ELEMENT: 1BB043
ROAP: 21ASD

EPA SUPPORT: $49,910

BEGINNING DATE: 6/29/73

COMPLETION DATE: 12/75

PROJECT DESCRIPTION:

A report is being prepared which provides design and cost information on the production, treatment and disposal of lime sludges. The reuse and recycling of lime sludges resulting from the removal of phosphates will be emphasized.

Final report is in press.

PROJECT TITLE: Experimental Investigation of the Aerobic Stabilization of Sludges from Wastewater Treatment

EXTRAMURAL PROJECT DIRECTOR:

John Puntenny
Metropolitan Denver Sewage Disposal
District #1; 3100 East 60th Avenue
Commerce City, Colorado 80022

MERL PROJECT OFFICER:

Dr. J. E. Smith, Jr.

PROJECT NO.: 68-03-0152 (Contract

PROGRAM ELEMENT: 1BB043

ROAP: 21ASD

EPA SUPPORT: $81,798

BEGINNING DATE: 1/30/72

COMPLETION DATE: 5/30/75

PROJECT DESCRIPTION:

This study comprises plant and pilot scale aerobic stabilization studies. In the plant scale study, emphasis is on the effect of load variation, while in the pilot study, emphasis is on the effects of varying solids concentration under aeration, detention time, dissolved oxygen level and loading. Both studies will look at the effect of temperature on performance. Further both studies consider the thickening and dewatering properties of the non-stabilized and stabilized sludges.

Final report was published September, 1975 (EPA 670/2-75-035).

PROJECT TITLE: Experimental Investigation of the Chemical Stabilization of Sludges from Wastewater Treatment

EXTRAMURAL PROJECT DIRECTOR:

Dr. Alan J. Shuckrow
Battelle Memorial Institute
Pacific Northwest Labs
P. O. Box 999
Richland, Washington 99352

MERL PROJECT OFFICER:

Dr. J. E. Smith, Jr.

PROJECT NO.: 68-03-0203 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASD

EPA SUPPORT: $84,800

BEGINNING DATE: 11/6/72

COMPLETION DATE: 5/31/75

PROJECT DESCRIPTION:

This evaluation program was designed to optimize both odor and pathogenic organism reduction and the spreading of lime-stabilized sludge on soils as a function of lime addition to raw sludge. Further, the quality of lime stabilized sludge resulting from the manipulation of pertinent parameters was investigated. An engineering and laboratory study period was employed to determine data pertinent to design and operation of a pilot plant. The pilot plant was then operated under optimum conditions to furnish sludge for soil studies.

Final report was published April, 1975 (EPA 670/2-75-012).

PROJECT TITLE: Full Scale Evaluation of Top Feed Vacuum Filtration for Dewatering

EXTRAMURAL PROJECT DIRECTOR:

Lawrence A. Ernest
Sewerage Commission of the City of Milwaukee
P. O. Box 2079, Jones Island
Milwaukee, Wisconsin 53201

MERL PROJECT OFFICER:

J. E. Smith, Jr.

PROJECT NO.: S-800969 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASD

EPA SUPPORT: $474,865

BEGINNING DATE: 6/1/73

COMPLETION DATE: 5/31/78

PROJECT DESCRIPTION:

This project will demonstrate on full plant scale the utility of top feed rotary vacuum filtration of waste activated sludge, a concept which was evaluated on pilot scale under EPA Project 17070 EVE. Two full scale rotary vacuum filters will be installed and evaluated side-by-side. One will be equipped for conventional bottom feeding and the other for top feeding. During the operational phase performance will be evaluated by comparing yield (output rate of dry filter cake solids), cake solids content, removal efficiency, conditioning chemical usage and the difficulty in maintaining proper conditioning with the two perating modes.

PROJECT TITLE: Heating An Anaerobic Digestor by Means of Solar Energy

EXTRAMURAL PROJECT DIRECTOR:

Jess W. Malcolm
Environmental Systems, Inc.
150 South Street
Annapolis, Maryland 21401

MERL PROJECT OFFICER:

R. V. Villiers

PROJECT NO.:* (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASD

EPA SUPPORT: $30,000

BEGINNING DATE: *

COMPLETION DATE: *

PROJECT DESCRIPTION:

Feasibility study of the concept of heating an anaerobic digestor by means of low energy solar energy so that the methane gas produced during anaerobid digestion of sludge can be used for a high energy application. Study will consist of detailing specifications for the equipment required for the solar energy system and of preparing a research plan for demonstrating the advantages of using solar energy as compared to methods presently used.

* This project is still in negotiation. Final contract dates and contract number are not yet decided.

PROJECT TITLE: Investigation to Utilize Organic Residues to Improve Sludge Dewatering Characteristics and to Produce Useable Fuels.

EXTRAMURAL PROJECT DIRECTOR:

Dr. Joe Schwartzbaugh
Systems Technology Corp.
3131 Encrete Lane
Dayton, Ohio 45439

MERL PROJECT OFFICER:

Dr. J. E. Smith, Jr.

PROJECT NO.: 68-03-2105 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASD

EPA SUPPORT: $122,177

BEGINNING DATE: 7/1/74

COMPLETION DATE: 12/31/76

PROJECT DESCRIPTION:

Both pilot and plant scale anaerobic digestion studies are being made of the short fiber fraction from the Franklin, Ohio, solid waste processing facility in admixture with sewage sludge. Dewatering tests are also being planned.

PROJECT TITLE: Magnetically Assisted Thickening of Wastewater Sludges

EXTRAMURAL PROJECT DIRECTOR:

Stanley R. Rich
RP Industries, Inc.
15 Kane Industrial Drive
Hudson, Massachusetts 01749

MERL PROJECT OFFICER:

Dr. J. E. Smith, Jr.

PROJECT NO.: 68-03-0136 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASD

EPA SUPPORT: $75,931

BEGINNING DATE: 6/1/72

COMPLETION DATE: 1/31/77

PROJECT DESCRIPTION:

In this project laboratory and pilot scale research is underway on a three-step process for the dewatering of waste activated sludge solids. These three steps are: (a) gravity drainage, (b) application of a magnetic force, and (c) application of a compression force. In this process non-magnetic sludge solids are rendered temporarily magnetic by the addition of small quantities of inert and nontoxic magnetic materials combined with small percentages of chemical coagulants. A magnetic separator is then utilized to separate the liquid from the solids.

PROJECT TITLE: Parameters Controlling the Interaction of Ash with Sludge Solids Wastewater Purification

EXTRAMURAL PROJECT DIRECTOR:

Dr. F. J. Micale
Center for Surface & Coatings Research
Lehigh University
Bethlehem, Penn. 18015

MERL PROJECT OFFICER:

Dr. J. E. Smith, Jr.

PROJECT NO.: 17030 ECM (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASD

EPA SUPPORT: $120,909

BEGINNING DATE: 6/1/69

COMPLETION DATE: New draft
Final report expected by 6/1/76

PROJECT DESCRIPTION:

The effect of various additives on the improved dewatering of activated sludge is being determined and the surface properties of the additives characterized in order to arrive at a mechanism for flocculation of activated sludge particles. The primary additives investigated are fly ash and 3 sludge incinerator ashes. All four ashes have high surface areas, 1.7 to $17\ m^2/g$, a hydrophilic surface and a high concentration of water soluble salts. Since the presence of salts and a solid surface complicates the interpretation of experimental results, a series of experiments were devised where either salts or solids alone were added to the activated sludge for settleability measurements. The solids consist of the washed ashes themselves, as well as two silicas, two carbon samples and magnetite, which contains high surface areas and exhibits different surface properties. The salts consist of the washings obtained from the ashes and a number of inorganic salts and ionic polymeric surfactants.

All four ashes greatly increase the rate of settling of activated sludge in the order Tahoe > Kansas > Millcreek > Beckjord. Repeated washing of the ashes has the effect of decreasing the rate of settling and changes the relative efficiency to Kansas > Millcreek > Beckjord > Tahoe. The hydrophilic silica carbon black and magnetite greatly increase the rate of settling while hydrophobic silica and graphon have very little effect. Halide salts and only the cationic polymeric surfactant are capable of increasing the rate settling. A dual mechanism, which was based on coulombic interaction between sludge particles and solid additives, is proposed.

The final report is being reviewed.

PROJECT TITLE: Pilot Scale Demonstration of Lime Stabilization

EXTRAMURAL PROJECT DIRECTOR:

Richard F. Noland
Burgess and Niple, Ltd.
2015 West Fifth Avenue
Columbus, Ohio

MERL PROJECT OFFICER:

Steven W. Hathaway

PROJECT NO.: 68-03-2181 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASD

EPA SUPPORT: $104,300

BEGINNING DATE: 2/13/75

COMPLETION DATE: 4/13/76

PROJECT DESCRIPTION:

To provide for a demonstration of lime stabilization at the Lebanon, Ohio Wastewater Treatment plant. The addition of lime to the sludge produced at the plant up to pH 12.2 and then subsequent land disposal and microbiological analysis. To provide research confirming the lime stabilization method and comparing it to anaerobic digestion. The chemical stabilization is to be a successful alternative to anaerobic digestion for plants overloaded with solids unable to complete solids handling by conventional methods.

PROJECT TITLE: Porteous Process for Heat Treatment of Sludge

EXTRAMURAL PROJECT DIRECTOR:

Robert J. Alban, Lake County Sanitary Eng.,
Project Director
Board of County Commissioners
Office of Lake County
H. T. Nolan Building
Painesville, Ohio

MERL PROJECT OFFICER:

B. Vincent Salotto

PROJECT NO.: 11010 DKI (Grant)
PROGRAM ELEMENT: 1BB043
ROAP: 21ASD

EPA SUPPORT: $377,099

BEGINNING DATE: 9/71
COMPLETION DATE: 12/1/75

PROJECT DESCRIPTION:

The purpose of this grant is to demonstrate at plant scale effect of heat treatment of sludge as regards dewatering of liquor. Also, it is the purpose of this grant to study ways in which the rich heat treatment supernatant can be treated in order to minimize its effect on the sewage treatment if returned to the plant. Minor objectives are to develop cost and performance data on the heat treatment process and investigate different operating conditions and determine optimum operating parameters.

PROJECT TITLE: Rotary Kiln Gasification of Solid Wastes and Sewage Sludge

EXTRAMURAL PROJECT DIRECTOR:
Mr. John Coffman
Wright Malta Corporation
Malta Test Station
Ballston Spa, New York 12020

MERL PROJECT OFFICER:

S. W. Hathaway

PROJECT NO.: 68-03-2350 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASD

EPA SUPPORT: $53,820

BEGINNING DATE: 8/1/75

COMPLETION DATE: 7/31/76

PROJECT DESCRIPTION:

The purpose of this project is to evaluate the technical merit of the Wright-Malta rotary kiln gasification process for unshredded solid waste and liquid sewage sludge. A laboratory scale "minikiln" will be constructed and tests for gas production, waste destruction, and pollutant emissions will be conducted.

PROJECT TITLE: Sludge Treatment Pilot Plant

EXTRAMURAL PROJECT DIRECTOR:

Allan Cassel
Dept. of Environmental Services
Government of the District of Columbia

MERL PROJECT OFFICER:

Irwin J. Kugelman

PROJECT NO.: 17070 EOG (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASD

EPA SUPPORT: $568,379

BEGINNING DATE: 7/1/69

COMPLETION DATE: 6/76

PROJECT DESCRIPTION:

The objective is to design, construct and operate a solids handling pilot plant which when operated in coordination with the existing biological and physical chemical pilot plants at the District of Columbia Water Pollution Control Plant will provide complete evaluation at all treatment systems. The plant consists of gravity or air thickening, vacuum filtration, and fluid bed incineration. The solids handling studies are being performed on physical chemical (lime) sludges and biological (raw and waste activated) sludges from the oxygen activated sludge system, the three stage activated sludge system which includes mineral addition; and a single stage activated sludge system which provides simultaneously BOD removal, nitrification and denitrification. The data obtained includes thickening, characteristics, dewatering (vacuum filter and centrifuge) characteristics, chemical conditioning requirements and stack gas analysis studies for air pollution control.

PROJECT TITLE: Source Control of Water Treatment Waste Solids

EXTRAMURAL PROJECT DIRECTOR:

Dr. Donald D. Adrian
Dept. of Civil Engineering
University of Massachusetts
Amherst, Mass. 01002

MERL PROJECT OFFICER:

Dr. J. E. Smith, Jr.

PROJECT NO.: 17070 DZS (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASD

EPA SUPPORT: $60,177

BEGINNING DATE: 6/1/69

COMPLETION DATE: Final report draft expected by 6/1/76

PROJECT DESCRIPTION:

This research is for the purpose of finding solutions to the sludge handling problem. Solutions are obtained by optimizing the design of sludge dewatering and drying beds. In order to optimize the design of these facilities additional research is carried out on the sludge dewatering process, the sludge drying process and the synthesis of dewatering and drying into economic designs.

A major accomplishment has been the development of computer programs for use in designing sand drying beds for the dewatering of water and sewage sludges. Computer input includes the characteristics of the sludge and physical environment.

PROJECT TITLE: Thermoradiation Treatment of Sewage Sludge Using Reactor Fission Products

EXTRAMURAL PROJECT DIRECTOR:

H. D. Sivinski (Sandia Labs)
Contact: Mr. Denny Krenz
U. S. Energy Research & Development Admin.
P. O. Box 5400
Albuquerque, New Mexico 87113

MERL PROJECT OFFICER:

Gerald Stern

PROJECT NO.: 0675 IAG-D5 Interagency Agreement

PROGRAM ELEMENT: 1BB043

ROAP: 21ASD

EPA SUPPORT: $150,000

BEGINNING DATE: 3/12/75

COMPLETION DATE: 8/30/76

PROJECT DESCRIPTION:

The objective of the research program is to constructively couple two environmental problems, disinfection and treatment of sewage sludge and disposal of nuclear waste materials. Successful coupling could lead to a mutually beneficial solution, the utilization of nuclear waste products in the disinfection and treatment of digested municipal sewage sludge.

For several years Sandia Laboratories has conducted studies on the use of simultaneously applied heat and ionizing gamma radiation (thermoradiation) for biological inactivation of viral and bacterial systems. More recently the studies have been expanded to include a parasite system. These studies show significant promise due to the inactivation synergisms exhibited by thermoradiation and the studies have been recently pointed toward investigation of thermoradiation for disinfection of sewage sludge using reactor waste fission products (e.g., ^{137}Cs). If this technology can be successfully transferred to sludges, it could provide a cost-effective alternative for sludge disinfection and treatment and also for the beneficial utilization of intermediate-life radioactive waste isotopes. The emphasis of the research program is on the disinfection of liquid digested sludge. The joint program will draw on prior studies to continue the research.

The ^{137}Cs necessary for a dynamic system (heat and radiation pulse in a single-pass flow-thru system) is installed and in operation in Sandia's Gamma Irradiation Facility. This system is being used to study effectiveness of thermoradiation on the three pathogens of choice, polio virus, coliform bacteria, and the Ascaris parasite. The results will guide the design of the pilot plant where additional studies will be completed on not only the biological, but also the chemical and physical characteristics of the digested sludge. Also, tests with the 0.16 liter batch thermoradiation unit, using ^{137}Cs are continuing, to guide optimization for disinfection of municipal wastewater sludges.

PROJECT TITLE: Agricultural Benefits and Environmental Changes Resulting from the Use of Digested Sludge on Field Crops and Criteria for Use in Selecting Disposal Sites

EXTRAMURAL PROJECT DIRECTOR:

T. D. Hinesly
Metropolitan Sanitary District of Greater Chicago
100 East Erie Street
Chicago, Illinois 60611

MERL PROJECT OFFICER:

G. K. Dotson
Wastewater Research Division, MERL

PROJECT NO.: S801356 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASE

EPA SUPPORT: $300,000

BEGINNING DATE: 6/24/74

COMPLETION DATE: 9/23/77

PROJECT DESCRIPTION:

The project is part of a long-term study of the technology and effects of utilizing liquid digested sewage sludge as a fertilizer and soil conditioner. The study began in 1967 with funding support from the PHS, HEW. Agronomy plots, lysimeters, and greenhouses are used to determine techniques of applying and managing sludge on cropland. Effects on soils, ground and surface water, crops and the animals that consume the crops is being studied. Reclamation of strip mine spoils with sludge is also being studied in lysimeters, plots, and in the greenhouses.

PROJECT TITLE: Blue Plains Pilot Plant: Nitrogen Recovery from Digested Sludge for Use in Fertilizer Production from Dewatered Sludge Solids

EXTRAMURAL PROJECT DIRECTOR:

Allan Cassel
Department of Environmental Services
Government of the District of Columbia
415 - 12th Street, N. W.
Washington, DC 20004

MERL PROJECT OFFICER:

Irwin J. Kugelman
Wastewater Research Division, MERL

PROJECT NO.: 68-01-0162

PROGRAM ELEMENT: 1BB043

ROAP: 21ASE

EPA SUPPORT: $88,000

BEGINNING DATE: 10/1/74

COMPLETION DATE: 3/1/76

PROJECT DESCRIPTION:

The objective is to collect engineering data necessary to evaluate various alternative schemes for the recovery of ammonia from anaerobic digested sludge. The flow diagram for three basic schemes consist of:

1. Centrifugation of digested sludge, CO_2 stripping of centrate, lime clarification of centrate, ammonia recovery of limed effluent by stripping and adsorption.
2. CO_2 stripping of digested sludge, liming, centrifuge classification of carbonate and non-carbonate solids, recovery at ammonia from centrate by stripping and absorption.
3. CO_2 stripping of digested sludge, liming, dewatering of all solids, recovery of ammonia from filtrate or centrate by stripping and absorption.

Thickening and dewatering properties of solids from each scheme are to be determined. Data is to be developed for the full scale design and operation of an ammonia recovery system by stripping, absorption and crystallization.

PROJECT TITLE: Co-Disposal of Sewage Sludge and Municipal Refuse

EXTRAMURAL PROJECT DIRECTOR:

Jose R. Rivero
Union Carbide Corporation-Linde Div.
P. O. Box 44
Tonawanda, New York 14150
(Grantee: Sanitary Board of City of
South Charleston, W. Va.)

MERL PROJECT OFFICER:

Robert A. Olexsey
Wastewater Research Division, MERL

PROJECT NO.: S803769 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASE

EPA SUPPORT: $150,000

BEGINNING DATE: 6/16/75

COMPLETION DATE: 6/30/77

PROJECT DESCRIPTION:

The purpose of this project is to demonstrate the ability of the Union Carbide Purox pyrolysis system to process a mixture of sewage sludge and solid waste. The organic materials will be converted into a medium BTU fuel gas. Testing will take place at the Union Carbide Company's 200 TPD solid waste demonstration plant.

PROJECT TITLE: Composting Sewage Sludge

EXTRAMURAL PROJECT DIRECTOR:

C. R. Albrecht
Maryland Environmental Services
Tawes State Office Building
Annapolis, Maryland 21401

MERL PROJECT OFFICER:

James A. Ryan
Wastewater Research Division, MERL

PROJECT NO.: S803468 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASE

EPA SUPPORT: $478,345

BEGINNING DATE: 7/1/75

COMPLETION DATE: 6/30/77

PROJECT DESCRIPTION:

An aeration system was developed which appears to compost raw sewage sludge without odors. Difficulties were encountered with winter windrow composting and various modifications of the system will be tested. Pathogen survival during composting will be studied.

Preliminary studies in the field and greenhouse indicate that heavy metal availability from compost is less than from sludge when applied to soils. Nitrogen mineralization studies are necessary to determine application rates. Plans are to study heavy metal-organic matter interaction.

PROJECT TITLE: Comprehensive Summary of Sludge Disposal Recycling History

EXTRAMURAL PROJECT DIRECTOR:

John Puntenny
Metro Denver Sewage District #1
3100 East 60th Avenue
Commerce City, Colorado 80022

MERL PROJECT OFFICER:

James Ryan
Wastewater Research Division, MERL

PROJECT NO.: 68-03-2064 (Contract)
PROGRAM ELEMENT: 1BB043
ROAP: 21ASE

EPA SUPPORT: $8,000

BEGINNING DATE: 6/25/74

COMPLETION DATE: 5/25/75

PROJECT DESCRIPTION:

The major objective of this project is to produce a report which is a summary of the sludge recycling history and associated research data from the Metropolitan Denver Sewage Disposal District No. 1.

PROJECT TITLE: Disposal of Stabilized Municipal Industrial Sludge in the Forest Environment

EXTRAMURAL PROJECT DIRECTOR:

Ralph Domenowske
Grant Director
Municipality of Metropolitan Seattle
600 First Avenue
Seattle, Washington 98104

MERL PROJECT OFFICER:

Gerald Stern
Wastewater Research Division, MERL

PROJECT NO.: R802172 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASE

EPA SUPPORT: $234,000

BEGINNING DATE: 5/1/74

COMPLETION DATE: 1/1/78

PROJECT DESCRIPTION:

Objectives of the study are: (a) Establish the effects of application of sludge on forest growth rate; (b) Establish efficient and effective methods of sludge application to forests; (c) Establish the rate of sludge application which has maximum benefits to forest growth with minimum impact on soil water quality and be nonpolluting to surface or ground waters; (d) Establish the short-term impacts of sludge application on the forest, including effects on microbiological organisms and higher plant species, physical and chemical properties of the forest and soil, and the chemistry of soil water.

The second year will continue with evaluation of the above objectives, and place particular emphasis on retention, movement and soil mass balance of certain elements contained in the sludge. Varying rates of sludge application on the mass balance of applied chemicals and forest growth will also be emphasized.

Retention movement and mass balance of chemicals contained in sludge including total organic analyses will be evaluated by resampling the forest soil by depths to establish the changes in elemental constituents, after application from the pretreatment condition.

Identification of the mechanisms of retention and movement of certain chemical elements is proposed through use of radioisotopes. The isotopes will be placed in confined soil columns and sampled at six-month intervals identifying the penetration of tagged isotopes to the type and size of soil particles.

Microbiological composition of the forest biomass will continue to be monitored for detection of rates of solubility changes, a specific concern being the susceptibility of microbial organisms to heavy metals at levels which may be toxic.

PROJECT TITLE: The Effect of Feeding to Cattle Crops Grown on Sludge Amended Soils

EXTRAMURAL PROJECT DIRECTOR:

John Baxter
Metropolitan Denver Sewage Disposal
District No. 1
3100 East 60th Avenue
Commerce City, Colorado 80022

MERL PROJECT OFFICER:

Gerald Stern
Wastewater Research Division, MERL

PROJECT NO.: IAG-R5-0768

PROGRAM ELEMENT: 1BB043

ROAP: 21ASE

EPA SUPPORT: $76,029

BEGINNING DATE: 7/1/75

COMPLETION DATE: 1/1/77

PROJECT DESCRIPTION:

Note: Part of this contract will be funded through an Interagency Agreement with Food and Drug Administration - FDA share - $45,000.

(a) To determine translocation of heavy metals, pathogens, pesticides from sludge to soil, to grass and to cattle.

(b) To determine via direct feeding experiments, translocation of heavy metals, pesticides and pathogens from sludge to cattle.

PROJECT TITLE: Land Disposal of Raw and Waste Activated Sludge

EXTRAMURAL PROJECT DIRECTOR:

Allan Cassel
Department of Environmental Services
Government of the District of Columbia
415 12th Street, NW
Washington, DC 20004

MERL PROJECT OFFICER:

T. P. O'Farrell
Wastewater Research Division, MERL

PROJECT NO.: 68-01-0162 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASE

EPA SUPPORT: $95,000

BEGINNING DATE: 4/72

COMPLETION DATE: 6/75

PROJECT DESCRIPTION:

The objectives are: (1) to determine the environmental effects (such as odors, nitrogen movement into ground water, and nitrogen phosphorus, and heavy metals uptake by plants) of land disposal (trenching) of various sludges (raw primary-activated, digested primary-activated, and mineral (alum) addition or lime treated sludges) in both greenhouse and field scale studies and (2) to evaluate field scale trenching application techniques for limed raw and digester sludges at very high loadings per acre (over 200 tons/acre). Greenhouse studies in sandy soils simulated trenching techniques and revealed nitrogen and organic movement through four feet of soil. In the field studies, initiated in May 1972, raw and digested sludges were limed to pH 11.5 to stabilize the sludges, successfully placed in trenches (2'-4' deep) and covered with backfill. Ground water samples were periodically withdrawn from field wells to determine movement of pollutants into the ground water; the area between trenches was planted with crops and trees. The results through November 1972 revealed essentially no movement of pollutants into the ground water and no odors or other esthetically objectionable effects and successful plant growth. The project is a cooperative study of the U.S. Department of Agriculture, the Maryland Environmental Services and the District of Columbia Department of Environmental Services.

PROJECT TITLE: Land Reclamation Through the Use of Digested Sewage Sludge

EXTRAMURAL PROJECT DIRECTOR:

James Braxton
Metropolitan Sanitary District of
Greater Chicago
100 East Erie
Chicago, Illinois

MERL PROJECT OFFICER:

G. K. Dotson
Wastewater Research Division, MERL

PROJECT NO.: 11010 DPW (Grant)
PROGRAM ELEMENT: 1BB043
ROAP: 21ASE

EPA SUPPORT: $540,000

BEGINNING DATE: 6/11/69

COMPLETION DATE: 6/11/76

PROJECT DESCRIPTION:

The principal objective was to use 100 acres of submarginal land (ash) to illustrate the benefits of using sewage sludge on land to improve physical characteristics and fertility of the land. It was part of Phase II (demonstration) of the pilot research and demonstration that is to eventually lead to utilization of all of Chicago's sludge as a soil conditioner and fertilizer. The sludge treated ash produced satisfactory crops, but efforts to measure effects on groundwater were unsuccessful.

PROJECT TITLE: Puretec Wet-Oxidation of Municipal Sludge

EXTRAMURAL PROJECT DIRECTOR:

Michael D. Nelson
Philadelphia Water Department
1140 Municipal Services Building
Philadelphia, Pennsylvania 19107

MERL PROJECT OFFICER:

B. V. Salotto
Wastewater Research Division, MERL

PROJECT NO.: S803644 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASE

EPA SUPPORT: $449,690

BEGINNING DATE: 6/1/75

COMPLETION DATE: 12/1/77

PROJECT DESCRIPTION:

The Puretec process is a heat treatment process designed to treat municipal and industrial type waste sludges. The process was developed by the Barber-Coleman Company of Irvine, California which is supplying the Philadelphia Water Department with a 16-ton per day Puretec wet-oxidation unit. The process reacts sludge under heat and pressure with sulfuric acid as a catalyst to decompose the sludge. The major objective of the grant is to demonstrate and evaluate on a plant scale that the process is a cost effective method of sludge treatment and disposal. The study will provide information on process efficiency, operating costs, and recovery.

PROJECT TITLE: Pyrolysis of Sewage Sludge and Sewage Sludge-Solid Waste Mixtures

EXTRAMURAL PROJECT DIRECTOR:

William S. Sanner
U. S. Bureau of Mines
4800 Forbes Avenue
Pittsburgh, Pennsylvania 15213

MERL PROJECT OFFICER:

Robert A. Olexsey
Wastewater Research Division, MERL

PROJECT NO.: IAG - D4-0436

PROGRAM ELEMENT: 1BB043

ROAP: 21ASE

EPA SUPPORT: $70,000

BEGINNING DATE: 4/1/74

COMPLETION DATE: 7/31/75

PROJECT DESCRIPTION:

The project will investigate the pyrolysis of sewage sludge and sewage sludge-solid waste mixtures under a variety of time and temperature conditions. Pyrolysis could prove to be an effective method of sewage sludge disposal that has minimum environmental impact and may exhibit operational disadvantages over conventional thermal degradation techniques. The Bureau of Mines has conducted research in the area of pyrolysis of coal for a number of years and has experimented with thermal processing techniques for municipal solid waste.

The project will be conducted at the Bureau of Mines Pittsburgh Energy Research Center laboratories in an existing experimental retort pyrolysis unit. Several combinations of starting material feeds will be investigated.

PROJECT TITLE: Review of Techniques for Incineration of Sewage Sludge with Solid Waste

EXTRAMURAL PROJECT DIRECTOR:

Walter R. Niessen
Roy F. Weston, Inc.
Weston Way
Westchester, Pennsylvania 19380

MERL PROJECT OFFICER:

Robert A. Olexsey
Wastewater Research Division, MERL

PROJECT NO.: 68-03-0475 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASE

EPA SUPPORT: $72,280

BEGINNING DATE: 6/4/74

COMPLETION DATE: 2/29/76

PROJECT DESCRIPTION:

The objective of this contract is to survey the available technology for incineration of sewage sludge with solid waste and assess the feasibility of each alternative approach. A literature survey, site visits, and contacts with practicing facilities will serve as the basis for determining the technical and economis merit of each technique. Engineering design and economic analysis of 4 selected techniques will be performed for 1, 10, and 100 mgd sewage treatment plants.

PROJECT TITLE: Safe Utilization of Sludges and Wastewater Effluents on Land

EXTRAMURAL PROJECT DIRECTOR:

U. S. Department of Agriculture
Biological Waste Management Laboratory
Beltsville, Maryland 20705

MERL PROJECT OFFICER:

G. K. Dotson
Wastewater Research Division, MERL

PROJECT NO.: IAG-D4-0510

PROGRAM ELEMENT: 1BB043

ROAP: 21ASE

EPA SUPPORT: $150,000

BEGINNING DATE: 5/1/74

COMPLETION DATE: 8/1/77

PROJECT DESCRIPTION:

Various methods of using or disposing of sludge on land are being studied. Development of technology for incorporating sludge in soil and for composting sludge with other carbonaceous materials, and determining environmental and health implications of various methods and rates of sludge application are among the principal objectives.

PROJECT TITLE: Treatment and Disposal of Wastes Pumped from Septic Tanks

EXTRAMURAL PROJECT DIRECTOR:

John Kolega
University of Connecticut
Storrs, Connecticut

MERL PROJECT OFFICER:

G. K. Dotson
Wastewater Research Division, MERL

PROJECT NO.: 17070 DKA (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASE

EPA SUPPORT: $220,000

BEGINNING DATE: 6/1/69

COMPLETION DATE: 6/1/76

PROJECT DESCRIPTION:

Studies of septic tank pumping practices and of attitudes regarding acceptance of septic tank sludge into the municipal treatment plants were followed by pilot studies of an aerobic-anaerobic treatment system, adding septage to incoming wastewater in a municipal wastewater treatment plant, and injecting the sludge in the soil. All three systems were presented as suitable methods of treating septage.

PROJECT TITLE: Treatment of Wastes Using Peat and Peat in Combination with Soil

EXTRAMURAL PROJECT DIRECTOR:

Rouse Farnham
Office of Iron Range Resources &
Rehabilitation
State of Minnesota
MEA Office Building
St. Paul, Minnesota 55101

PROJECT NO.: 17050 EAN (Grant)
PROGRAM ELEMENT: 1BB043
ROAP: 21ASE

EPA SUPPORT: $87,000

MERL PROJECT OFFICER:

G. K. Dotson
Wastewater Research Division, MERL

BEGINNING DATE: 7/1/69
COMPLETION DATE: 7/1/76

PROJECT DESCRIPTION:

The objective was to determine the effectiveness of various kinds of peat and peat-soil mixtures as filter media in treating sewage. Application techniques, the mechanism of BOD and phosphorus removal from the sewage and regeneration of the adsorptive capacity of the peat were studied. Drained plots in a natural peat bog, lysimeters, and columns in the laboratory were used in the study. Thin layers of peat over sand were found to be effective in removal of BOD and phosphorus from sewage. The draft of the final report has been prepared.

PROJECT TITLE: Wastewater Solids Utilization on Land Demonstration

EXTRAMURAL PROJECT DIRECTOR:

Dr. A. J. Kaplovsky
Ocean County Sewerage Authority
Toms River, New Jersey

MERL PROJECT OFFICER:

G. K. Dotson
Wastewater Research Division, MERL

PROJECT NO.: S801871 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASE

EPA SUPPORT: $300,000

BEGINNING DATE: 6/72

COMPLETION DATE: 2/77

PROJECT DESCRIPTION:

The objective of the project is to demonstrate the feasible beneficial application of liquid digested sewage sludge on various crops on sand coastal plain soils. About 8 acres are divided into 1/4 acre plots. Sludge is applied at rates of 10, 20, and 40 tons per acre and the effects on crops and the environment of each application rate are measured.

PROJECT TITLE: Ammonia Removal from Wastewater by Ligand Exchange

EXTRAMURAL PROJECT DIRECTOR:

Dr. Lloyd Smith
Gillette Research Institute
1413 Research Boulevard
Rockville, Maryland 20850

MERL PROJECT OFFICER:

Dr. Richard A. Dobbs
Wastewater Research Division, MERL

PROJECT NO.: 68-03-0455 (Contract)
PROGRAM ELEMENT: 1BB043
ROAP: 21ASO

EPA SUPPORT: $71,000

BEGINNING DATE: 5/17/74

COMPLETION DATE: 7/17/75

PROJECT DESCRIPTION:

Project demonstrated the feasibility of using copper-form exchanger for removal of ammonia from wastewater.

PROJECT TITLE: Autotropic Denitrification Using Sulfur-Electron Donors

EXTRAMURAL PROJECT DIRECTOR:

Dr. Alonzo William Lawrence
Dept. of Environmental Engineering
Cornell University
Ithaca, NY 14850

MERL PROJECT OFFICER:

E. F. Barth
Wastewater Research Division, MERL

PROJECT NO.: R803505-01 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASO

EPA SUPPORT: $95,612

BEGINNING DATE: 12/15/74

COMPLETION DATE: 12/14/76

PROJECT DESCRIPTION:

Because of the rapidly increasing cost of crude oil and the potential decrease in the availability of methanol and other organic chemicals used in wastewater treatment, it is desirable to seek alternative methods of denitrification. The overall objective of this project is to evaluate the microbial kinetics, and to assess the process feasibility of autotropic microbial mediated denitrification using sulfur electron donors. This will be accomplished by (1) preliminary delineation, via batch culture experiments of metabolic and environmental requirements of sulfur oxidizing bacteria; (2) evaluation of continuous culture kinetics such as temperature and pH; and (3) evaluation of some non-kinetic factors, e.g. process configuration, physical form of sulfur, effluent quality.

PROJECT TITLE: El Lago Advanced Waste Treatment Facility

EXTRAMURAL PROJECT DIRECTOR:

Mr. William Wilson
Harris County Water Control & Improvement District #50
1122 Cedar Lane
Seabrook, Texas 77586

MERL PROJECT OFFICER:

E. F. Barth
Wastewater Research Division, MERL

PROJECT NO.: 11010 GNM (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASO

EPA SUPPORT: $395,804

BEGINNING DATE: 9/15/70

COMPLETION DATE: 12/15/75

PROJECT DESCRIPTION:

The project will consist of modification and additions to an existing high rate trickling filter plant with the objective of improving of the quality of the plant effluent. It will incorporate equipment and facilities for removal of phosphorus by iron salts and polymer, and removal of nitrogen by nitrification and denitrification using methanol as a chemical supplement. The completed facility will be operated as a demonstration plant where economics of these processes and water quality can be examined and monitored and the results made public.

PROJECT TITLE: An Evaluation of Pollution Control Processes in Upper Thompson Sanitation District

EXTRAMURAL PROJECT DIRECTOR:

Giles Gere
Upper Thompson Sanitation District
P. O. Box 568
Estes Park, Colorado 80517

MERL PROJECT OFFICER:

E. F. Barth
Wastewater Research Division, MERL

PROJECT NO.: 802641 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASO

EPA SUPPORT: $333,300

BEGINNING DATE: 6/1/75

COMPLETION DATE: 8/31/78

PROJECT DESCRIPTION:

The Upper Thompson Sanitation District (U.T.S.D.) was formed to provide wastewater treatment services to the area surrounding Estes Park, Colorado. This area is adjacent to the Rocky Mountain National Park, a major tourist attraction in Colorado. Because of the highly visible area that the U.T.S.D. will serve, numerous processes had to be included in the plant design to achieve the desired treatment objectives.

As a result, a unique combination of conventional and advanced waste treatment processes were developed. Major components of the treatment scheme are: flow equalization, activated sludge treatment, biological nitrification, multimedia filtration, and ozonation for disinfection. Flexibility of phosphorus removal has been provided and with minor additions attached growth denitrification on the multimedia filters can be incorporated into the system.

This combination of processes represents a culmination of process development work that has previously been carried out at the field scale by various investigators. The proposed research project will verify on a full scale basis many processes that have been shown to be feasible alternatives to accomplish advanced wastewater treatment of municipal wastewater.

An essential research feature will be the full-scale comparative study of two different types of attached growth nitrification media.

The desired effluent quality will manage not only to meet Colorado State requirements but also tuned to 1977 guidelines of best practicable treatment.

The research on ozone as a suitable full-scale alternate to chlorine as a municipally used disinfectant has national significance.

PROJECT TITLE: Hatfield Township Advanced Waste Treatment Facility

EXTRAMURAL PROJECT DIRECTOR:

Tracy Greenlund
Hatfield Township Municipal Authority
Mr. Charles Hartley, Secretary
P. O. Box 2
Colmar, Pennsylvania 18915

MERL PROJECT OFFICER:

E. F. Barth
Wastewater Research Division, MERL

PROJECT NO.: 11060FRQ (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASO

EPA SUPPORT: $126,878

BEGINNING DATE: 3/19/71

COMPLETION DATE: 7/1/75

PROJECT DESCRIPTION:

This project provides for the demonstration, analysis and evaluation of the Hatfield Township advanced waste treatment plant which must produce a high quality effluent for discharge to the Neshaminy Creek.

BOD_5, NOD, suspended solids and phosphorus will be controlled by an integrated series of unit processes including lime precipitation, biological nitrification, tertiary coagulation and filtration. Equalization tanks are used to provide constant flow to the advanced processes.

Presently the plant is in the shake-down stage for equipment and process capability. Background analytical data on wastewater quality and receiving water quality are being collected. Bids for chemical supplies have been let, and operator training is in progress.

PROJECT TITLE: Phosphorus Removal in Biochemical Systems at the EPA-DC Pilot Plant

EXTRAMURAL PROJECT DIRECTOR:

Allan Cassel, Sanitary Engineer
Department of Environmental Services
Government of the District of Columbia

PROJECT NO.: 68-01-0162 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASO

EPA SUPPORT: $40,000

MERL PROJECT OFFICER:

T. P. O'Farrell
Wastewater Research Division, MERL

BEGINNING DATE: 10/1/72

COMPLETION DATE: 6/30/75

PROJECT DESCRIPTION:

The objectives are to evaluate phosphorus removal by mineral addition ($FeCl_3$ and alum) in the three-stage activated sludge system for nitrification-denitrification and in a single stage activated sludge system with simultaneous BOD removal, nitrification and denitrification; to evaluate Technicon sensors for continuous phosphorus measurement in the pilot processes; and to determine the effects of the mineral addition (pH and solids wasting) on the nitrification-denitrification processes within the treatment systems. In the three-stage system, the $FeCl_3$ is added to the first stage (modified aeration) at a dosage of about 1.2:1 Fe/P and alum is added to the third stage (denitrification) at a dose of 3 to 4:1 AL/P. Phosphorus residuals of about 0.1 mg/l as P are achieved after filtration of the denitrified effluent. Alum will be added at various AL/P ratios to the last pass of the single stage system to determine the phosphorus removal and the effect of pH reduction and increased solids wasting on the nitrification and denitrification in the system.

PROJECT TITLE: Single Stage Nitrification Denitrification Full-Scale Study

EXTRAMURAL PROJECT DIRECTOR:

George Austin, Superintendent
Town of Owego, Department of Public Utilities
111 East Main Street
Apalachin, New York 13732

MERL PROJECT OFFICER:

E. F. Barth
Wastewater Research Division, MERL

PROJECT NO.: S803618 (Grant)
PROGRAM ELEMENT: 1BB043
ROAP: 21ASO

EPA SUPPORT: $49,497

BEGINNING DATE: 3/1/75

COMPLETION DATE: 2/29/76

PROJECT DESCRIPTION:

The objective of this project is to demonstrate the feasibility, on a full-scale basis, of nitrogen removal in an extended-aeration activated sludge plant. Additional objectives will be to determine design and operating criteria for application of the concept to existing and proposed wastewater treatment facilities in the United States.

The existing wastewater treatment plant at Owego, New York, is proposed for the study because of the wide seasonal range of wastewater temperatures it experiences, and because its design features, current operating conditions, and staff capability are ideally suited to maximize the technical objectives of the study.

PROJECT TITLE: Soluble Organic Nitrogen Characteristics and Removal

EXTRAMURAL PROJECT DIRECTOR:

Dr. Perry L. McCarty
Department of Civil Engineering
Stanford University
Stanford, California 94305

MERL PROJECT OFFICER:

Charles I. Mashni
Wastewater Research Division, MERL

PROJECT NO.: R804001 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASO

EPA SUPPORT: $90,120

BEGINNING DATE: 9/22/74

COMPLETION DATE: 9/21/76

PROJECT DESCRIPTION:

The purpose of this work is to determine the characteristics and nature of soluble organic nitrogen compounds which sometimes exceed the proposed effluent standards for total (both organic and inorganic) nitrogen. Isolation and identification of these compounds will be attempted using conventional analytical methods as well as modern analytical instruments such as infrared spectroscopy, gas chromatography, and mass spectrometry. The impact of these compounds on the receiving water to include algal growth stimulation will be evaluated. Various chemical and physical processes for removal of soluble organic nitrogen will be investigated including chemical precipitation, oxidation using several oxidants, and adsorption. Cost-effective analysis will be made on the most promising process.

PROJECT TITLE: Backwash of Granular Filters Used in Wastewater Filtration

EXTRAMURAL PROJECT DIRECTOR:

Dr. J. L. Cleasby
Iowa State University
Ames, Iowa 50010

MERL PROJECT OFFICER:

Dr. Sidney A. Hannah
Wastewater Research Division, MERL

PROJECT NO.: R802140 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASQ

EPA SUPPORT: $111,949

BEGINNING DATE: 9/71

COMPLETION DATE: 1/76

PROJECT DESCRIPTION:

The aims of this project are to determine, through laboratory and pilot studies, the necessary information for rational physical design of filters for use in wastewater treatment. Primary emphasis is placed on determining the relationships between media characteristics and the physical requirements of reactor design. The project theme is based on the factors which influence the ability to thoroughly cleanse the media during the backwash cycle. All individual studies are designed toward gaining maximum understanding of these factors.

Laboratory studies on the expansion and intermixing of various types and sizes of granular filtration media are well underway and will be completed during this budget period. The causes and effects of intermixing of media will be continued in the laboratory and will be instituted in the pilot plant. The relative effects of different auxiliary washing techniques will also be studied in the pilot plant in parallel to assess the utility of these techniques. Also, the necessary quality of backwash water and/or physical equipment involved in the backwashing system will be assessed along with variations in washing techniques.

PROJECT TITLE: Evaluation of In-Depth Filtration for Wastewater Treatment Using a Mobile Pilot Plant

EXTRAMURAL PROJECT DIRECTOR:

Dr. Donald Feuerstein
Project Manager
Engineering-Science, Inc.
Arcadia, California 91006

MERL PROJECT OFFICER:

James F. Kreissl
Wastewater Research Division, MERL

PROJECT NO.: 17030 DHZ (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASQ

EPA SUPPORT: $127,610

BEGINNING DATE: 4/13/70

COMPLETION DATE: 4/30/76

PROJECT DESCRIPTION:

The objective of this project is to develop design and operating criteria for in-depth filtration as applied to the treatment of various wastewaters for the purposes of clarification and/or phosphorus removal. Various coagulants, modes of filter operation and degrees of pretreatment will be evaluated to achieve different levels of product quality for activated sludge, trickling filter and primary effluents. A profile of application for in-depth filtration will be developed. A unique feature of the proposed research is development of an accurate process control technique.

PROJECT TITLE: Evaluation of Tertiary Granular Media Filters

EXTRAMURAL PROJECT DIRECTOR:

Dr. J. A. FitzPatrick
Department of Civil Engineering
Northwestern University
Evanston, Illinois 60201

MERL PROJECT OFFICER:

Dr. Sidney A. Hannah
Wastewater Research Division, MERL

PROJECT NO.: R803212 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASQ

EPA SUPPORT: $122,800

BEGINNING DATE: 12/74

COMPLETION DATE: 11/76

PROJECT DESCRIPTION:

The objectives of the project are: 1) to ascertain the extent of adoption of granular media filters for tertiary treatment of municipal wastewaters in the continental U.S., 2) to collect and evaluate the operating data which are available for the tertiary filters in the States of Illinois, Indiana, Michigan and Wisconsin, and 3) to carry out a detailed evaluation of the performance of a number of tertiary filters. Tertiary filters are intended to achieve higher levels of removal of BOD and suspended solids from municipal wastewaters than can be achieved by secondary treatment alone. The filter performance will largely depend on filter design and operation. Performance may also vary depending on whether an activated sludge process or a trickling filter is used for secondary treatment. The approach for this project will be to obtain operating data from tertiary filter installations in Illinois and select two filters for a preliminary sampling period. Samples will be obtained of the secondary and tertiary effluents. These will be analyzed for BOD, suspended solids, and several other water quality parameters. Statistical distributions of loading and performance parameters and effluent variables will be obtained. The dependence and independence of variables and parameters will be tested. Hypothetical functional relationships between performance parameters and independent variables will be determined. Hypotheses about operation and performance will be ascertained. The composite of this information will serve as a framework to analyze data obtained in a twelve-month intensive sampling period of a number of tertiary filters.

PROJECT TITLE: Hanover Tertiary Plant Studies

EXTRAMURAL PROJECT DIRECTOR:

Dr. Cecil Lue-Hing
Director of Research & Development
Metropolitan Sanitary District of
Greater Chicago
100 East Erie Street
Chicago, Illinois 60611

MERL PROJECT OFFICER:

James F. Kreissl
Wastewater Research Division, MERL

PROJECT NO.: WPRD 92-01-68

PROGRAM ELEMENT: 1BB043

ROAP: 21ASQ

EPA SUPPORT: $263,182

BEGINNING DATE: 5/1/68

COMPLETION DATE: 4/30/76

PROJECT DESCRIPTION:

The objective of this project is to evaluate the performance of various combinations of chemical treatment, rapid sand filtration, microstraining, chlorination, and post oxidation for a 1 MGD tertiary treatment plant, and to evaluate the performance of up and down flow sand filters, ion exchange units, and ammonia separators on a pilot-plant scale.

The final report on this project is being reviewed.

PROJECT TITLE: Pomona Research and Development Facility (Effect of Chemical Addition on Effluent Filtration)

EXTRAMURAL PROJECT DIRECTOR:

Leon Directo
Los Angeles County Sanitary District
Los Angeles, California
(Pomona Pilot Plant
295 South Roselawn Avenue
Pomona, California 91766)

MERL PROJECT OFFICER:

Dr. Irwin J. Kugelman
Wastewater Research Division, MERL

PROJECT NO.: 14-12-150

PROGRAM ELEMENT: 1BB043

ROAP: 21ASQ

EPA SUPPORT: $9,000

BEGINNING DATE: 7/1/74

COMPLETION DATE: 1/1/76

PROJECT DESCRIPTION:

Two dual media (coal over sand) automated pressure filters each with a maximum capacity of 10 gpm/ft^2 will be utilized in parallel to filter secondary effluent from the main (10 MGD) Pomona secondary treatment plant. The following will be evaluated during the study:

(a) Air plus water backwash vs. surface wash plus water backwash.

(b) Injection of alum just ahead of the filter vs. direct filtration of secondary effluent.

(c) Effect of addition of anionic polymer with alum directly ahead of the filter.

(d) Comparison of alum coagulation and sedimentation vs. direct feed of alum prior to filtration.

The performance will be judged on the basis of effluent suspended solids and rate of pressure drop build up. Although most of the studies will utilize non-nitrified secondary effluent, some runs will be made with nitrified effluent from the nitrification stage of the units used in task 21-ASO 030.

PROJECT TITLE: Actinomycetes of Sewage Treatment Plants

EXTRAMURAL PROJECT DIRECTOR:

Hubert A. Lechevalier
Rutgers University
Wakswan Institute of Microbiology
New Brunswick, New Jersey 08903

MERL PROJECT OFFICER:

Ronald F. Lewis
Wastewater Research Division, MERL

PROJECT NO.: R803701 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $27,870

BEGINNING DATE: 5/1/75

COMPLETION DATE: 8/31/76

PROJECT DESCRIPTION:

The objective of this study is to gain a better understanding of the reasons why *Nocardia* species of actinomycetes are blossoming in so many activated sludge sewage treatment plants and to try to develop a rational approach to the control of their growth; thus, removing the nuisance effect and the health hazard associated with the large-scale production of aerosols containing *Nocardia*, some of which belong to known pathogenic species.

PROJECT TITLE: Blue Plains Pilot Plant: Comparative Evaluation of Step Aeration, Plug Flow, and Complete Mix Activated Sludge

EXTRAMURAL PROJECT DIRECTOR:

Allan Cassel
Department of Environmental Services
Government of the District of Columbia
415 - 12th Street, N. W.
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MERL PROJECT OFFICER:

Irwin J. Kugelman
Wastewater Research Division, MERL

PROJECT NO.: 68-01-0162

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $157,000

BEGINNING DATE: 10/1/73

COMPLETION DATE: 4/1/76

PROJECT DESCRIPTION:

To compare in parallel the three primary modes of the activated sludge process. Operation will be on primary effluent from the D.C. Blue Plains Treatment Plant. Specifically, the following will be determined on each mode:

(1) Sludge production vs. F/M and SRT

(2) BOD removal vs. F/M and SRT

(3) Sludge sedimentation characteristics vs. F/M and SRT

PROJECT TITLE: Case History of Upgrading an Existing Trickling Filter Plant at Livermore, California

EXTRAMURAL PROJECT DIRECTOR:

Richard J. Stenquist
Brown & Caldwell Consulting Engineers
1501 North Broadway
Walnut Creek, California 94596

MERL PROJECT OFFICER:

Richard C. Brenner
Wastewater Research Division, MERL

PROJECT NO.: 68-03-2175 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $35,968

BEGINNING DATE: 2/6/75

COMPLETION DATE: 2/5/76

PROJECT DESCRIPTION:

A detailed report will be prepared which will discuss and describe the upgrading of the Livermore, California water reclamation plant from a roughing filter-oxidation pond operational mode to a coupled trickling filter-activated sludge operational mode. The report will be presented in the form of a case history including the time span prior to and leading up to the decision to convert the plant to a coupled trickling filter-activated sludge system through the operational period of December 1973.

PROJECT TITLE: Case History of Upgrading an Existing Trickling Filter Plant at Stockton, California

EXTRAMURAL PROJECT DIRECTOR:

Richard J. Stenquist
Brown & Caldwell Consulting Engineers
1501 North Broadway
Walnut Creek, California 94596

MERL PROJECT OFFICER:

Richard C. Brenner
Wastewater Research Division, MERL

PROJECT NO.: RFP CI-75-0214 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $97,390

BEGINNING DATE: 6/1/73

COMPLETION DATE: 2/28/77

PROJECT DESCRIPTION:

The purpose of this project is to prepare a case history report on the upgrading of the Stockton, California Wastewater Treatment Plant. The upgrading consisted of converting three of six rock media trickling filters to plastic media. This modification increased the hydraulic capacity and resulted in an improvement in effluent quality and the achievement of nitrification. The report will include detailed chapters on the histody of the plant prior to conversion, design for media conversion, construction phase, startup phase, plant operations and performance summary, performance evaluation and analysis, and general design considerations for converting rock to plastic media trickling filtration.

PROJECT TITLE: Demonstration of Full Scale Open Tank Pure Oxygen Activated Sludge System

EXTRAMURAL PROJECT DIRECTOR:

John L. Puntenny
Metropolitan Denver Sewage Disposal
District No. 1
3100 East 60th Avenue
Commerce City, Colorado 80022

MERL PROJECT OFFICER:

Richard C. Brenner
Wastewater Research Division, MERL

PROJECT NO.: S803910 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $200,000

BEGINNING DATE: 6/1/75

COMPLETION DATE: 5/30/77

PROJECT DESCRIPTION:

The objectives of this project are to convert a three pass diffused air system to a single pass open tank pure oxygen system and to evaluate the performance of the pure oxygen system at varying food to micro-organism ratios, detention times, ambient temperature and diurnal flow conditions. Also, a determination of the design criteria for a full scale conversion of the existing secondary system to an open tank pure oxygen system will be made. Oxygen utilization efficiency, solids settling characteristics, power requirements will be observed. The feasibility of using this technology at other overloaded plants will be demonstrated.

PROJECT TITLE: Demonstration of Phosphorus Removal and Performance Upgrading on a Municipal RBC Wastewater Treatment Plant

EXTRAMURAL PROJECT DIRECTOR:

David L. Kluge
Administrative Engineer
Village of Pewaukee
226 Oakton Avenue
Pewaukee, Wisconsin 53072

MERL PROJECT OFFICER:

Richard C. Brenner
Wastewater Research Division, MERL

PROJECT NO.: S802905 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $389,152

BEGINNING DATE: 7/15/69

COMPLETION DATE: 1/30/76

PROJECT DESCRIPTION:

A mineral addition project will be undertaken to evaluate phosphorus removal and overall upgrading potential for a 0.3 municipal wastewater treatment plant employing the Rotating Biological Contactor (RBC) process. Aluminum sulfate and ferric chloride will each be dosed at two different injection points, the influent channel to the RBC units (after primary clarification) and the effluent channel leaving the RBC units (before secondary clarification). An eight-month testing program is planned, four months with aluminum sulfate and four months with ferric chloride. The objectives of the project are to consistently produce an effluent phosphorus concentration of 1.0 mg/l ± 0.5 mg/l and decrease effluent BOD_5 and suspended solids residuals from conventional operation levels of 20-30 mg/l to 15 mg/l or less.

PROJECT TITLE: Demonstration of the Pure Oxygen Aeration Process to Upgrade Existing Wastewater Treatment Plant

EXTRAMURAL PROJECT DIRECTOR:

William Pressman
New York City
Department of Water Resources
Municipal Building
New York, New York 10007

MERL PROJECT OFFICER:

Richard C. Brenner
Wastewater Research Division, MERL

PROJECT NO.: S802714 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $1,574,625

BEGINNING DATE: 7/1/70

COMPLETION DATE: 11/30/75

PROJECT DESCRIPTION:

The major objectives of this project are to demonstrate that oxygen aeration can be applied without expansion to upgrade an existing modified air aeration activated sludge plant from 75% ± treatment to 90% + treatment and that a molecular sieve oxygen gas generation unit can be successfully integrated into the total process to supply oxygen requirements.

One 20 mgd bay was isolated from 15 other similar bays of New York City's Newtown Creek modified aeration plant and converted to the Union Carbide submerged turbine-sparger oxygen aeration option. A 15 ton/day Pressure Swing Adsorption oxygen generation plant was installed along with a liquid oxygen backup supply system. After system startup and shakedown, a one-year demonstration was commenced in mid-September 1972.

Early results indicate that effluent BOD_5 and suspended solids concentrations of approximately 10 and 15 mg/l, respectively, are being produced in the oxygen test train at a constant flow of 20 mgd (equivalent to an aeration detention time based on raw wastewater flow of 1.4 hours). Corresponding F/M and volumetric organic loadings approximate 0.7 lb BOD_5 applied/day/lb MLVSS and 150 lb BOD_5 applied/day/1000 ft^3, respectively. In contrast, the remainder of the plant (the 15 unconverted bays) is producing an effluent with average BOD_5 and suspended solids concentrations of about 30 and 40 mg/l, respectively, at a nominal aeration based on raw wastewater flow of 2.5 hours. Oxygen train performance is currently being evaluated under diurnal flow variations. Subsequent phases will determine the ultimate organic and/or hydraulic loading capacity of the oxygen train and phosphorus removal efficiencies possible via mineral addition to the oxygen aerator.

PROJECT TITLE: Evaluation of Materials for Construction of Wastewater Treatment Facilities Using Oxygen and Ozone Processes

EXTRAMURAL PROJECT DIRECTOR:

Bernie Jones & Henry Uyeda
Materials Science Section
USDI, Bureau of Reclamation
Engineering and Research Center
Denver, Colorado 80225

MERL PROJECT OFFICER:

James V. Basilico
Office of Air, Land and Water Use
Washington, DC

PROJECT NO.: IAG - 0187 (D)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $245,000

BEGINNING DATE: 6/72

COMPLETION DATE: 1/76

PROJECT DESCRIPTION:

The objective of this project is to evaluate the suitability of materials for advanced wastewater treatment plants utilizing ozone and oxygen-rich environments. The project will develop a list of construction materials suitable for construction of ozone and oxygen wastewater treatment facilities and prepare a comprehensive report describing recommended usage. Results of test exposures up to two years will be utilized for recommendations. The test specimens will be exposed at full-scale operating plants and will consist of various materials including metallic components, nonmetallic materials, various types of concrete and coatings.

PROJECT TITLE: Field Study of Nutrient Control in a Multi-Cell Lagoon

EXTRAMURAL PROJECT DIRECTOR:

Carl M. Schwing, Director
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Charles County Community College
P. O. Box 910
La Plata, Maryland 20646

MERL PROJECT OFFICER:

Edward Opatken
Wastewater Research Division, MERL

PROJECT NO.: R803637 (Grant)
PROGRAM ELEMENT: 1BB043
ROAP: 21ASR

EPA SUPPORT: $140,742

BEGINNING DATE: 6/1/75
COMPLETION DATE: 5/31/78

PROJECT DESCRIPTION:

The principal objective of this project is the development of reliable techniques consistent with the basic simplicity of lagoon operation for removing phosphorus and unoxidized nitrogen from lagoon effluents. Two in-cell injection points will be evaluated to determine the potential of alum addition for efficiently removing phosphorus from wastewater being processed in a three-cell combined aerated faculative lagoon. A sidestream of effluent from the last cell of this test lagoon will be diverted through a plastic-media trickling filter tower to evaluate the potential for achieving consistent nitrification with this type of second stage biological treatment.

The secondary objective is the acquisition of reliable long-term data from well designed and well operated three-cell combined aerated/faculative lagoon not receiving alum addition which will be operated in parallel with the test system and serve as a control. Assessment of the effect of alum addition, not only on phosphorus removal, but also on suspended solids and organic removals and determination of additional costs and operating requirements necessitated by the nutrient control procedures.

PROJECT TITLE: High Performance Bio-Treatment of Municipal Sewage

EXTRAMURAL PROJECT DIRECTOR:

Carl Beer
New York State Department of Health
84 Holland Avenue
Albany, New York 12208

MERL PROJECT OFFICER:

Richard C. Brenner
Wastewater Research Division, MERL

PROJECT NO.: WPRD 143-01-67 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $371,125

BEGINNING DATE: 6/21/68

COMPLETION DATE: 1/31/76

PROJECT DESCRIPTION:

The project objective is to develop a high efficiency biological treatment process and other related process units that is, especially useful for smaller communities, compatible with modern requirements and technology.

A novel 120,000 gpd pilot plant has been constructed on the grounds of the New York State Vocational Institute in West Coxsackie, New York, to treat the sewage of the resident inmate population. The treatment facilities consist of an aerated equalization tank, a two-stage split-culture activated sludge regime, intermediate upflow activated sludge clarifiers, multi-compartment horizontal flow (with inclined trays) final clarifiers, a multi-compartmented tank for batch aerobic digestion of waste activated sludge, and Purifax equipment for high pressure chlorination treatment of primary sludge.

A two-year experimental development program has recently begun in which the above facilities will be evaluated in various sequences to optimize treatment of small (but widely varying) flows for maximum removal of organic carbon materials, suspended solids, phosphorus, and nitrogen. The results of this project will have greatest application to small communities with typical broad-swing diurnal flow patterns.

PROJECT TITLE: The Laboratory Evaluation of a Method for Enhancing the Kinetics of Activated Sludge Treatment Plants

EXTRAMURAL PROJECT DIRECTOR:

J. F. Fair
Houston Research, Inc.
8330 Broadway
Houston, Texas 77017

MERL PROJECT OFFICER:

Ronald F. Lewis
Wastewater Research Division, MERL

PROJECT NO.: 68-01-0042 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $32,528

BEGINNING DATE: 5/21/71

COMPLETION DATE: 12/1/75

PROJECT DESCRIPTION:

The purpose of this study was to increase the operating efficiency and capacity of municipal activated sludge plants. This would be accomplished by disrupting a portion of the microbial cells in the return sludge releasing enzymes from within the cells directly into the wastewater and eliminating the rate controlling action of the cell wall-plasma membrane barrier. These laboratory experiments were conducted with bench-scale activated sludge waste treatment units, and the disruption of microbial cells in the sludge was accomplished by use of a sonic oscillator. Degradation rates of a number of specific organic compounds were studied in units receiving regular activated sludge or varying proportions of disrupted sludge.

PROJECT TITLE: Lagoon Efficiency and Effluent Disinfection

EXTRAMURAL PROJECT DIRECTOR:

Dr. James Reynolds
Utah State University
Utah Water Research Lab
Logan, Utah 84322

MERL PROJECT OFFICER:

Albert D. Venosa
Wastewater Research, MERL

PROJECT NO.: 68-03-2151 (Contract)
PROGRAM ELEMENT: 1BB043
ROAP: 21ASR

EPA SUPPORT: $105,000

BEGINNING DATE: 12/9/74

COMPLETION DATE: 1/9/77

PROJECT DESCRIPTION:

The objectives of this project are two-fold: (1) to define the lagoon equivalency to disinfection without addition of disinfecting agents; (2) to determine whether the lagoon effluent can be chlorinated to destroy total and fecal coliforms without adversely affecting the organic quality of the effluent stream. Theoretically, application of large doses of an oxidizing agent such as chlorine to a lagoon effluent containing high quantities of algae may result in an unfavorable increase in the effluent soluble BOD due to algal lysis. Thus, one process (i.e. disinfection) achieving compliance with one standard (i.e. coliform reduction) might induce noncompliance with another standard (i.e. effluent BOD reduction).

Flexibility of the Logan (Utah) lagoon allows placement of chlorinators and chlorine contactors at any desired location. Construction of intermittent slow-sand filters following the final cell of the lagoon has been completed on EPA Contract 68-03-0281. One 50,000 gpd flow stream will be diverted from a secondary cell of the lagoon, passed through the sand filter, and then chlorinated, for comparison with three identical but unfiltered 50,000 gpd flows receiving different chlorine dosages. The usual chemical analyses will supplement all bacteriological tests. Since the BOD test is unreliable in chlorinated effluents, soluble COD tests will be performed to measure the extent of algal lysis following chlorination.

PROJECT TITLE: Measurement of Active Biomass Concentrations in Biological Waste Treatment Processes

EXTRAMURAL PROJECT DIRECTOR:	PROJECT NO.: R800354 (Grant)
Dr. Frederick G. Pohland Professor of Civil Engineering School of Civil Engineering Georgia Institute of Technology Atlanta, Georgia 30332	PROGRAM ELEMENT: 1BB043 ROAP: 21ASR EPA SUPPORT: $50,327
MERL PROJECT OFFICER:	BEGINNING DATE: 7/1/70
Ronald F. Lewis Wastewater Research Division, MERL	COMPLETION DATE: 7/1/75

PROJECT DESCRIPTION:

The purpose of the research is to define the applicability and limitations of the dehydrogenase assay for measurement of the active biomass associated with biological treatment of domestic and industrial wastewaters. The specific objectives are: (a) to study the effects of varying organic content and nutritional deficiencies on the dehydrogenase activities of biological sludges, (b) to study the relationship between the active biomass concentrations and dehydrogenase activities of biological sludges undergoing endogenous metabolism, and (c) to develop a laboratory procedure for correlating dehydrogenase activities with the active biomass concentrations of biological sludges obtained from prototype and industrial treatment processes.

The studies have been conducted with pure cultures of bacteria and mixed cultures in batch and continuous flow systems using a variety of defined food materials or actual wastes. The range of dehydrogenase enzyme activity under the varying conditions has been established as well as a definite correlation between dehydrogenase activity and ATP content of the cells.

PROJECT TITLE: Methods for Improvement of Trickling Filter Plant Performance

EXTRAMURAL PROJECT DIRECTOR:	PROJECT NO.: 14-12-503 (Contract)
James C. Brown University of North Carolina School of Public Health Chapel Hill, North Carolina 27514	PROGRAM ELEMENT: 1BB043 ROAP: 21ASR EPA SUPPORT: $611,837
MERL PROJECT OFFICER:	
Richard C. Brenner Wastewater Research Division, MERL	BEGINNING DATE: 6/6/69 COMPLETION DATE: 7/30/75

PROJECT DESCRIPTION:

The objective of this research project was to evaluate and demonstrate potential methods for upgrading the performance of high-rate trickling filter systems.

Three major investigations were carried out using facilities of the joint University of North Carolina/City of Chapel Hill municipal treatment plant: (a) Single-stage trickling filter operation was compared with two-stage trickling filter operation in pilot units with equivalent volumes in both systems. (b) Overall system removal was analyzed in the full-scale plant as a function of final settling tank overflow rate. (c) Alum addition to the final clarifier was evaluated as an upgrading technique in the full-scale plant.

Data from these investigations indicate: (a) In any treatment plant with two or more trickling filters, provisions for series or staged operation of the filters will produce significantly better treatment than operating the filters in parallel as single-stage units. (b) Funds spent on additional final settling tank capacity is perhaps the most economical method of improving performance of trickling filter plants. (c) Controlled dosing of liquid alum just ahead of the final settling tank yielded the greatest improvement in treatment efficiency of all methods studied on this project and can upgrade the performance of a high-rate trickling filter plant from marginal levels to one comparable with a well operated conventional activated sludge plant.

PROJECT TITLE: Nitrification Studies

EXTRAMURAL PROJECT DIRECTOR:

Jack A. Borchardt, Professor
Department of Civil Engineering
Division of Research Development & Adm.
Research Adm. Building, North Campus
Ann Arbor, Michigan 48105

MERL PROJECT OFFICER:

Richard C. Brenner
Wastewater Research Division, MERL

PROJECT NO.: R803407 (Grant)
PROGRAM ELEMENT: 1BB043
ROAP: 21ASR

EPA SUPPORT: $97,532

BEGINNING DATE: 1/6/75
COMPLETION DATE: 1/5/77

PROJECT DESCRIPTION:

This project involves the study of biological nitrification of two different municipal wastewater treatment plant effluents, (type A) a high-rate trickling filter plant effluent and (type B) a continuous-flow, two-stage, facultative lagoon effluent.

The effluents from each of these plants contain unoxidized nitrogen compounds in the form of organic and ammonia nitrogen. Two rotating biological contactor (RBC) pilot plants will be designed, fabricated, and installed, one each, at the effluent end of the above two full-scale treatment plants. The principal objective of this research project is to operate and monitor these pilot units to determine whether RBC's can induce nitrification of and some incremental overall quality improvement in the effluents of either or both of these plants. If the results are positive, the secondary objectives will be to optimize performance and generate design factors for extrapolation to construction of larger-scale second-stage RBC nitrification systems.

PROJECT TITLE: One-Year Performance Evaluation of Existing Aerated Lagoon System - Pawnee, Illinois

EXTRAMURAL PROJECT DIRECTOR:

Roger Alexander
Village Manager
Village of Pawnee
619 Douglass Street
Pawnee, Illinois 62558

MERL PROJECT OFFICER:

Ronald F. Lewis
Wastewater Research Division, MERL

PROJECT NO.: R803900 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $103,560

BEGINNING DATE: 6/30/75

COMPLETION DATE: 4/30/77

PROJECT DESCRIPTION:

The principal objective of this project is to generate year-round performance data for a typical aerated lagoon system, operating on domestic wastewater in the north midwest. A second objective is to evaluate the effectiveness of this system in relation to its design criteria and to the secondary treatment standards of PL 92-500. Work will be conducted at the existing 3-cell "Air-Aqua" lagoon system at Pawnee, Illinois.

PROJECT TITLE: Open Tank Oxygenation System for Accelerated Sewage Treatment

EXTRAMURAL PROJECT DIRECTOR:

Duane Parker
FMC Corporation
Environmental Equipment Division
3999 South Mariposa Street
Englewood, Colorado

MERL PROJECT OFFICER:

Richard C. Brenner
Wastewater Research Division, MERL

PROJECT NO.: S801790 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $192,483

BEGINNING DATE: 9/25/72

COMPLETION DATE: 7/1/75

PROJECT DESCRIPTION:

The objective of this project is to develop a technically feasible and economically attractive open-tank oxygen aeration activated sludge system.

An ultra-fine (<0.2 mm) bubble diffuser, developed by Martin Marietta Corp., will be evaluated for feasibility of dissolving oxygen gas and obtaining a high overall oxygen utilization factor in an open-tank activated sludge aerator. (Commercially available oxygen aeration systems to date have all utilized covered-tank aerators.) The diffuser works on the shear principle with mixer liquor continuously recycled through the diffuser at right angles to injected oxygen gas. To be economically realistic, 90% or greater of the oxygen bubbles must dissolve before rising to the aerator liquid surface. This concept will be evaluated in a 30 gpm pilot plant located on the grounds of a suburban Denver wastewater treatment plant.

At the date of this writing, the 30 gpm pilot plant is in the process of being fabricated. A one-year experimental program will commence in spring 1973 after installation and "shakedown".

PROJECT TITLE: Oxygen Activated Sludge Studies on Primary, Secondary and Raw Wastewaters

EXTRAMURAL PROJECT DIRECTOR:

Allan Cassel, Sanitary Engineer
Department of Environmental Services
Government of the District of Columbia
415 - 12th Street, N.W.
Washington, DC 20004

MERL PROJECT OFFICER:

Irwin J. Kugelman
Wastewater Research Division, MERL

PROJECT NO.: 68-01-0162 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $50,000

BEGINNING DATE: 10/1/72

COMPLETION DATE: 1/1/76

PROJECT DESCRIPTION:

The objectives of the study are to evaluate air flotation as an alternate to gravity settling in an oxygen activated sludge process with conventional plug flow of primary effluent; to evaluate step feeding of primary effluent into the oxygen activated sludge reactor; to evaluate the conventional "plug" flow operation on D.C. raw wastewater; and to evaluate oxygen nitrification of D.C. secondary (modified aeration) effluent. Each of the two oxygen activated sludge systems consists of 4 totally mixed stages to approximate "plug" flow in the reactor and includes external oxygen recirculation within each stage and co-current oxygen-wastewater flow between stages. The study provides product quality, sludge production, kinetic rates of nitrification and solids separation characteristics. To date, air flotation clarification did not produce satisfactory suspended solids in the effluent from the clarifier as compared to gravity clarification.

PROJECT TITLE: Performance Evaluation of Existing Aerated Lagoon System at Bixby, Oklahoma

EXTRAMURAL PROJECT DIRECTOR:

George W. Reid
University of Oklahoma
Office of Research Administration
1000 Asp Avenue
Norman, Oklahoma 73069

MERL PROJECT OFFICER:

Ronald F. Lewis
Wastewater Research Division, MERL

PROJECT NO.: R803916 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $67,317

BEGINNING DATE: 7/1/75

COMPLETION DATE: 5/1/77

PROJECT DESCRIPTION:

The primary objective of this project is to generate reliable year-round performance data for a typical multi-cell aerated lagoon waste disposal system in warm southmidwestern region of the country. The data will be utilized to evaluate the effectiveness of the multi-system lagoon to perform in accordance with its design criteria and the ability of such a design criteria to meet the Federal Secondary Treatment Standards as established in 1972.

PROJECT TITLE: Performance Evaluation of Existing Aerated Lagoon System at Koshkonong, Wisconsin

EXTRAMURAL PROJECT DIRECTOR:

Lawrence B. Polkowski
Department of Civil Engineering
The University of Wisconsin
750 University Avenue
Madison, Wisconsin 53706

MERL PROJECT OFFICER:

Ronald F. Lewis
Wastewater Research Division, MERL

PROJECT NO.: R803930 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $90,000

BEGINNING DATE: 7/1/75

COMPLETION DATE: 3/31/77

PROJECT DESCRIPTION:

The objectives of the project are: to obtain the performance data for a 12-month period of a well designed, well operated multi-cell aerated lagoon treating municipal wastewater, and to utilize the collected data for the evaluation of the reliability and effectiveness of the Koshkonong aerated lagoon system to perform according to design criteria, as well as to evaluate its ability to meet secondary treatment standards corresponding to the Federal Water Pollution Control Act Amendments of 1972.

Data will be collected on the operation and performance of a three-cell series flow aerated lagoon system treating municipal wastewater as follows: 1) The system influent and effluent daily flow variations with recorded maximum, average, and minimum flows will be monitored; and 2) Water quality parameters at five locations, influent, intermediate points between cells 1 and 2, cells 2 and 3, lagoon effluent and chlorinated effluents will also be monitored. Sampling frequency will be selected to reflect performance consistent with determining relationship to secondary treatment effluent guidelines proposed by EPA for 1977. Water quality parameters such as water temperature, pH, DO, TSS, VSS, alkalinity, BOD_5 total and soluble, COD total and soluble, TKN, ammonia, nitrite, nitrate and phosphate will be determined. In addition, fecal coliform and algae counts will be made.

The results will be evaluated in terms of effluent guideline compliance and recommended design criteria for aerated lagoon systems subject to large seasonal variations.

PROJECT TITLE: Performance Evaluation of Existing Aerated Lagoon System at Windber, Pennsylvania

EXTRAMURAL PROJECT DIRECTOR:

Dr. Charles M. Earnest
Assistant Professor of Chemistry
University of Pittsburgh
Johnstown Campus
3017 Cathedral of Learning
Pittsburgh, Pennsylvania 15260

MERL PROJECT OFFICER:

Ronald F. Lewis
Wastewater Research Division, MERL

PROJECT NO.: R803975 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $88,216

BEGINNING DATE: 7/1/75

COMPLETION DATE: 5/1/77

PROJECT DESCRIPTION:

The objective of this work is to make a detailed chemical and biological evaluation of the aerated lagoon system presently operated by the Windber Area Water Authority of Windber, Pennsylvania. The three-cell Hinde Aqua Lagoon unit will be sampled at five points within the system. The samples will be collected at the (a) lagoon influent, (b) between lagoon cells in series, (c) lagoon effluent (unchlorinated), and (d) after effluent chlorination. The samples will undergo extensive chemical analysis as well as fecal coliform counts and algae cell counts. Variables such as weather, wastewater temperature, daily flow entering and leaving the lagoon, and electrical requirement for operation of the plant will also be recorded. The study will be 12 months with one 30-day period in each season of continuous sampling. The results will be evaluated by EPA to aid in future lagoon design.

PROJECT TITLE: Performance Evaluation of Existing Combined Aerated/Facultative Lagoon System at North Gulfport, Mississippi

EXTRAMURAL PROJECT DIRECTOR:

Dr. A. J. Englande, Jr.
Assistant Professor
Department of Environmental Health Sciences
Tulane University
1430 Tulane Avenue
New Orleans, Louisiana 70112

MERL PROJECT OFFICER:

Ronald F. Lewis
Wastewater Research Division, MERL

PROJECT NO.: R803899 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $88,767

BEGINNING DATE: 7/1/74

COMPLETION DATE: 4/30/77

PROJECT DESCRIPTION:

This project will generate reliable year-round performance data for a well-designed combination aerated/facultative lagoon system located in North Gulfport, Mississippi, evaluate obtained data with respect to design criteria and the lagoon's ability to comply with the secondary treatment requirements of PL 92-500, and utilize the collected data for defining possible design and operational upgrading techniques and future research needs.

One year of lagoon system performance data will be collected and evaluated with respect to the preceding objectives. Flow-composite samples will be collected at the following locations: lagoon influent, between cells in series, lagoon effluent, and after chlorination.

Sampling frequency will be 30 consecutive days, four times during the year and 7 consecutive days once a month during the other 8 months of the performance evaluation.

Measurements and analyses to be performed include wastewater flow, alkalinity, total and soluble BOD_5, total and soluble COD, suspended solids, volatile suspended solids, Kjeldahl nitrogen, ammonia nitrogen, nitrite nitrogen, nitrate nitrogen, total phosphorus, fecal coliform counts, and algae cell counts. Temperature, pH and dissolved oxygen measurements will be made in situ. Meterological, maintenance, and electrical usage data will also be collected and evaluated.

PROJECT TITLE: Performance Evaluation of Existing Lagoon

EXTRAMURAL PROJECT DIRECTOR:

Ross E. McKinney
Professor of Civil Engineering
University of Kansas Center for Research, Inc.
2385 Irving Hill Drive - Campus West
Lawrence, Kansas 66045

MERL PROJECT OFFICER:

Ronald F. Lewis
Wastewater Research Division, MERL

PROJECT NO.: 68-03-2059 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $53,666

BEGINNING DATE: 7/25/74

COMPLETION DATE: 2/25/76

PROJECT DESCRIPTION:

The objective of this project is to determine the operational characteristics of an oxidation pond system treating domestic sewage from a small midwestern community. An existing 3-cell domestic sewage oxidation pond system will be evaluated in detail over a 12-month period. Chemical and biological analyses will be made in order to permit evaluation of the normal operating characteristics of the oxidation pond system during each of the seasons of the year.

PROJECT TITLE: Performance Evaluation of Existing Lagoon (Kilmichael, Miss.)

EXTRAMURAL PROJECT DIRECTOR:

Donald Hill
Mississippi State University
P. O. Drawer DE
Mississippi State, Miss. 39762

MERL PROJECT OFFICER:

Ronald F. Lewis
Wastewater Research Division, MERL

PROJECT NO.: 68-03-2061 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $55,113

BEGINNING DATE: 7/19/75

COMPLETION DATE: 1/19/76

PROJECT DESCRIPTION:

The purpose of this project is to generate reliable performance data on continuoualy operated waste stabilization ponds to determine their performance in accordance with design criteria and government regulations on water pollution standards. Year-round collection of data will be made on a three-cell facultative oxidation pond serving the community of Kilmichael, Mississippi, and on aerated lagoon followed by settling zone and chlorination in use by the Crossgates Subdivision of Jackson, Mississippi. An evaluation of the effectiveness of the waste stabilization ponds studied will be made.

PROJECT TITLE: Performance Evaluation of Existing Lagoons

EXTRAMURAL PROJECT DIRECTOR:	**PROJECT NO.:** 68-03-2060 (Contract)
James Reynolds Utah Water Research Laboratory Utah State University Logan, Utah 48322	**PROGRAM ELEMENT:** 1BB043 **ROAP:** 21ASR **EPA SUPPORT:** $53,137
MERL PROJECT OFFICER:	**BEGINNING DATE:** 7/19/74
Ronald F. Lewis Wastewater Research Division, MERL	**COMPLETION DATE:** 2/19/76

PROJECT DESCRIPTION:

The general objective of this project is to generate reliable year-round performance data at two different existing small, rural, well designed and operating facultative municipal wastewater lagoons. The data will be evaluated to determine the effectiveness of the lagoon systems to perform in accordance with their design criteria and to meet Secondary Treatment Standards as established by the Federal Water Pollution Control Amendments of 1972.

PROJECT TITLE: Performance Evaluation of Existing Lagoons - Petersborough, N. H.

EXTRAMURAL PROJECT DIRECTOR:

Stuart P. Bowers
JBF Scientific Corporation
2 Ray Avenue
Burlington, Massachusetts 01803

MERL PROJECT OFFICER:

Ronald F. Lewis
Wastewater Research Division, MERL

PROJECT NO.: 68-03-2062 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $55,771

BEGINNING DATE: 6/15/74

COMPLETION DATE: 1/15/76

PROJECT DESCRIPTION:

The objective of this project is to evaluate performance of existing wastewater treatment lagoons at Petersborough, N. H., including developing a detailed sampling methodology, designing, constructing and installation of wastewater sampling equipment at the lagoon site. A one-year sampling and analytical program will be conducted and an evaluation of the lagoon performance will be made as compared with design criteria.

PROJECT TITLE: Preparation of Manual on Algae and Water Pollution

EXTRAMURAL PROJECT DIRECTOR:

Dr. C. M. Palmer
Kendal at Longwood
Box 220
Kennett Square, Pennsylvania 19348

MERL PROJECT OFFICER:

Ronald F. Lewis
Wastewater Research Division, MERL

PROJECT NO.: 68-03-0232 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $12,633

BEGINNING DATE: 3/22/73

COMPLETION DATE: 1/1/76

PROJECT DESCRIPTION:

The objective of this work is for the contractor to prepare a manuscript for revision of the manual on Algae and Water Supplies (U.S. Public Health Service Publication No. 657-195). The title and emphasis would be changed from Algae and Water Supplies to Algae and Water Pollution. Chapters would be added dealing with Algae and Eutrophication, Algae and Pollution, Algae as Indicators of Water Quality, Algae in Streams, and Algae in Waste Stabilization Ponds. Present chapters would be brought up to date.

PROJECT TITLE: Reduction of Toxicity Emission Rates from Wastewater Treatment Plants by Optimization of the Chlorination Process

EXTRAMURAL PROJECT DIRECTOR:

Endel Sepp
Associate Sanitary Engineer
California State Department of Health
Berkeley, California

MERL PROJECT OFFICER:

Albert D. Venosa
Wastewater Research Division, MERL

PROJECT NO.: S803459 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $344,200

BEGINNING DATE: 5/15/75

COMPLETION DATE: 1/1/78

PROJECT DESCRIPTION:

The purpose of this project is to develop an improved chlorine contactor design system to accomplish three primary objectives: (1) Develop and demonstrate an optimum design chlorine mixing and contacting system that will provide effective disinfection with low chlorine-induced toxicity; (2) Develop uniform tests that will provide a meaningful method of measuring the true performance of chlorine contactor systems; (3) Use the information obtained to develop a manual of design and practice for wastewater chlorination systems.

The objectives are to be accomplished by designing and constructing a trailer-mounted idealized chlorine mixing and contacting system and a trailer-mounted bioassay laboratory. A "slip-stream" of effluent from eight different full-scale wastewater treatment plants will be chlorinated in parallel with the flow being processed in the plants. Both streams will be evaluated for reduction in bacterial numbers to specified levels and for toxicity to receiving water biota. Results of the project will be used to produce a comprehensive manual on the subject of wastewater chlorination and chlorine-induced toxicity.

PROJECT TITLE: Removal of BOD and Nitrogen in a Single-Stage Activated Sludge System

EXTRAMURAL PROJECT DIRECTOR:

Allan Cassel, Sanitary Engineer
Department of Environmental Services
Government of the District of Columbia
415 - 12th Street, N.W.
Washington, DC 20004

MERL PROJECT OFFICER:

Thomas P. O'Farrell
Wastewater Research Division, MERL

PROJECT NO.: 68-01-0162 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $151,000

BEGINNING DATE: 9/1/72

COMPLETION DATE: 3/1/76

PROJECT DESCRIPTION:

The objectives are to evaluate the feasibility of BOD removal, nitrification and denitrification in a single activated sludge system under varying seasonal conditions; to determine the effect of solids production and wasting on the nitrification and denitrification; and to determine the supplemental methanol requirements for complete denitrification. One single-stage system to be used employs alternating periods of cycling dissolved oxygen in which the D.O. varies from above 2 mg/l to essentially zero in a reactor operated at F/M ratios of 0.15 to 0.20 lb of BOD/lb of MLVSS/day. The cycling D.O. permits alternating nitrification and denitrification by the activated sludge mass. Mixed liquor from the discharge of the reactor is recycled to the reactor influent to allow the BOD of the wastewater to serve as the carbon source for improved denitrification. The system includes an optional (1 hour detention) denitrification basin for methanol denitrification before the gravity settler. A second system to be tested is a plug flow reactor with aeration at the front and back sections of the reactor and an anaerobic section in the middle. Operational parameters will be similar to those of the complete mix system with air supply on a time cycle.

PROJECT TITLE: Separation of Algae Cells from Wastewater Lagoon Effluents

EXTRAMURAL PROJECT DIRECTOR:

Walter J. O'Brien
University of Kansas Center for
Research, Inc.
2385 Irving Hill Road, Campus West
Lawrence, Kansas 66044

MERL PROJECT OFFICER:

Ronald F. Lewis
Wastewater Research Division, MERL

PROJECT NO.: 68-03-0280 (Contract)
PROGRAM ELEMENT: 1BB043
ROAP: 21ASR

EPA SUPPORT: $106,438

BEGINNING DATE: 6/19/73

COMPLETION DATE: 12/30/75

PROJECT DESCRIPTION:

The objective of this project is to investigate the feasibility of using rock filters to remove algae from wastewater lagoon effluents. The field test facility, which will be constructed at Endova, Kansas, will contain two filters operated in parallel, one will consist of gravel one half to two inches in diameter, and the other filter will contain gravel two to four inches in diameter. The hydraulic loading on these filters will be varied between 60 and 150 gallons/day/20 cu. ft. of submerged filter volume. Design, construction and operational guidelines will be determined for each filter.

PROJECT TITLE: Separation of Algal Cells from Wastewater Lagoon Effluent

EXTRAMURAL PROJECT DIRECTOR:

E. Joe Middlebrooks
Utah Water Research Laboratory
Utah State University
Logan, Utah 84322

MERL PROJECT OFFICER:

Ronald F. Lewis
Wastewater Research Division, MERL

PROJECT NO.: 68-03-0281 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $222,759

BEGINNING DATE: 6/9/73

COMPLETION DATE: 4/76

PROJECT DESCRIPTION:

The overall objective of this proposal is to construct and evaluate the performance of intermittent sand filters in removing algal cells from wastewater lagoon effluents. An economic evaluation of the process will be made. Six intermittent sand filters will be constructed and their performance evaluated. The filter sludge will be examined as to its quantity, nature and treatability; recycling of the sludge directly to the primary section of the lagoon will be evaluated. Soil irrigation studies will also be evaluated as a method of removing algae from lagoon effluents.

PROJECT TITLE: A Simplified Method of High Purity Oxygen Injection into Activated Sludge Processes

EXTRAMURAL PROJECT DIRECTOR:

Lloyd D. Hedenland
Las Virgenes Municipal Water District
4232 Las Virgenes Road
Calabasas, California 91302

MERL PROJECT OFFICER:

Richard C. Brenner
Wastewater Research Division, MERL

PROJECT NO.: 802356 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $186,309

BEGINNING DATE: 7/1/71

COMPLETION DATE: 8/30/75

PROJECT DESCRIPTION:

The principal objective of this project is to demonstrate upgrading of an existing air aerated activated sludge plant with a simplified single-stage oxygen contact system, using existing aeration tanks, blowers, and diffusers to greatly reduce the cost of dissolution equipment.

A 2 mgd aeration bay at the Las Virgenes Municipal Water District Tapia Water Reclamation Facility has been converted to a single-stage oxygen system using an inflated oxygen tent tank cover to contain the oxygen-rich atmosphere over the aerator. A conventional centrifugal air blower, corrosion proofed on the suction side and modified to be compatible with oxygen gas, is used to recirculate gas from within the tent cover through conventional coarse bubble spiral roll air diffusers. Virgin oxygen is introduced to the system through a fine bubble sparger. This simplified oxygen dissolution concept was designed by the Cosmodyne Division of Cordon International.

The system is currently being evaluated on a one-year demonstration run. One conservatively designed phase (nominal aeration time based on raw wastewater flow = 9.5 hours) has been completed to date to determine if effluent acceptable for agricultural recycle could be produced. Effluent quality for the phase averaged BOD_5 = 2 mg/l, COD = 35 mg/l, suspended solids = 9 mg/l and was completely nitrified. At the high sludge age (>70 days) induced by this type of operation, total biological sludge production was virtually nil. However, the reduced sludge wasting pattern permitted a buildup of grease and other poor settling debris, thereby deteriorating sludge settling characteristics (SVI = 200 ml/gram ±). Subsequent phases of the experimental program will examine system performance and sludge characteristics at 4 and 2 hours of nominal aeration time (based on raw wastewater flow).

PROJECT TITLE: Study of Activated Sludge Separation by Dynamic Straining

EXTRAMURAL PROJECT DIRECTOR:

Arvid Strom
FMC Corporation
Environmental Equipment Division
1800 FMC Drive, West
Itasca, Illinois 60143

MERL PROJECT OFFICER:

Richard C. Brenner
Wastewater Research Division, MERL

PROJECT NO.: 68-03-0427 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $32,000

BEGINNING DATE: 5/1/74

COMPLETION DATE: 9/30/75

PROJECT DESCRIPTION:

The proposed work is an outgrowth of a prior project conducted for EPA under Contract #68-03-0102. The results of that work were sufficiently encouraging to merit further investigation.

The objective of this work is to demonstrate consistent performance of the primary straining of mixed liquor activated sludge and to characterize the suspended solids that escape the primary strainer and to evaluate alternative methods for removing them to produce a highly clarified effluent.

PROJECT TITLE: Summary of Oxygen-Activated Sludge Treatment at Fairfax County, Virginia

EXTRAMURAL PROJECT DIRECTOR:

Curtis S. McDowell
Air Products & Chemicals Inc.
P. O. Box 538
Allentown, Pennsylvania 18105

MERL PROJECT OFFICER:

Richard C. Brenner
Wastewater Research Division, MERL

PROJECT NO.: 68-03-0405 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $25,750

BEGINNING DATE: 3/28/74

COMPLETION DATE: 7/31/75

PROJECT DESCRIPTION:

The oxygen-activated sludge system installed and operated at the Westgate Wastewater Treatment Plant in Fairfax County, Virginia is the first oxygenation facility to utilize surface aerators for oxygen dissolution. The objective of this project is to summarize, document and evaluate design parameters, construction and startup activities, and operating performance data for this facility. The report will be presented in the form of a case history including the time span prior to and leading up to the decision to convert the existing Westgate plant to oxygen aeration.

PROJECT TITLE: Tertiary Solids Removal Following Combined Chemical-Trickling Filter Treatment

EXTRAMURAL PROJECT DIRECTOR:

James C. Brown
University of North Carolina
School of Public Health
Chapel Hill, North Carolina 27514

MERL PROJECT OFFICER:

Richard C. Brenner
Wastewater Research Division, MERL

PROJECT NO.: 68-03-0225 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $60,000

BEGINNING DATE: 3/14/73

COMPLETION DATE: 9/30/75

PROJECT DESCRIPTION:

Two or more tertiary processes, including settling ponds and granular media filtration, will be evaluated in depth for removing suspended solids (principally chemical floc particles) from aluminum sulfate (alum) coagulated and settled trickling filter plant effluent. The upstream trickling filter plant shall be a full-scale municipal high-rate system as typically operated in this country with effluent (settled or unsettled) recirculation and a secondary clarifier surface loading of 800 gpd/ft^2 or greater. Aluminum sulfate shall be continuously applied to the trickling filter effluent just prior to introduction to the secondary clarifier. Previous experience has established that the optimum alum dose is 200 mg/1 ± 25 mg/1.

PROJECT TITLE: Three-Stage Activated Sludge for Nitrification Denitrification

EXTRAMURAL PROJECT DIRECTOR:

Allan Cassel, Sanitary Engineer
Department of Environmental Services
Government of the District of Columbia
415 - 12th Street, N.W.
Washington, DC 20004

MERL PROJECT OFFICER:

Thomas P. O'Farrell
Wastewater Research Division, MERL

PROJECT NO.: 68-01-0162 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASR

EPA SUPPORT: $40,000

BEGINNING DATE: 10/1/72

COMPLETION DATE: 6/30/75

PROJECT DESCRIPTION:

The objectives are to evaluate system reliability with seasonal variations, to determine the kinetic rates of nitrification and denitrification at various wastewater temperatures, to provide design data with chemical requirements and, in coordination with an automation study, to develop instrumentation and process control automation for the system.

The system at the EPA-DC Pilot Plant consists of primary sedimentation, modified aeration with alum or $FeCl_3$ addition, nitrification, denitrification with methanol addition and alum addition and filtration. The system is operated at a nominal flow rate of 50,000 gpd with a maximum (rain) diurnal peak to average flow variation of 2:1. Instrument control loops (both analog and digital) are being developed for the chemical additions, pH control points and for D.O. control in the aeration basin.

PROJECT TITLE: Controlled Treatment System - Ultraviolet Disinfection

EXTRAMURAL PROJECT DIRECTOR:

Emerson Langrell
Community of St. Michaels, Maryland

PROJECT NO.: WPRD 139-01-67 (17060FAA) (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASS

EPA SUPPORT: $90,065.92

MERL PROJECT OFFICER:

Albert D. Venosa
Wastewater Research Division, MERL

BEGINNING DATE: 2/29/68

COMPLETION DATE: 6/30/75

PROJECT DESCRIPTION:

The primary objective of this project is to determine the feasibility of incorporating a controlled treatment system in an existing waste treatment plant. The specific subobjectives are to optimize operations of present secondary activated sludge plant; determine minimum UV dose that will yield an effluent with < 40 counts of total coliform/100 ml; establish a significant reduction in fecal coliform and virus content; improve calibration of the UV sensing system.

PROJECT TITLE: New Microbial Indicators of Wastewater Disinfection Efficiency

EXTRAMURAL PROJECT DIRECTOR:

Dr. R. S. Engelbrecht
University of Illinois
Urbana, Illinois 61801

MERL PROJECT OFFICER:

Albert D. Venosa
Wastewater Research Division, MERL

PROJECT NO.: R802712 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASS

EPA SUPPORT: $81,975

BEGINNING DATE: 4/1/72

COMPLETION DATE: 6/30/75

PROJECT DESCRIPTION:

This is a cooperative project with shared funding from both EPA and the U.S. Army Medical Research and Development Command. The objectives of the project are to isolate from wastewater through disinfection tests microorganisms sufficiently resistant to chlorine that their destruction should assure an effluent free from enteric pathogens and to compare the chlorine resistance of these isolates with that of coliform bacteria and virus pathogens to determine origin and improve the methods for recovering resistant indicator organisms.

PROJECT TITLE: Ozone Pilot Plant Studies

EXTRAMURAL PROJECT DIRECTOR:

Henry Gahn
Los Angeles County Sanitation District
Los Angeles, California

MERL PROJECT OFFICER:

Dr. Irwin J. Kugelman
Wastewater Research Division, MERL

PROJECT NO.: 14-12-150 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASS

EPA SUPPORT: $50,000

BEGINNING DATE: 7/1/73

COMPLETION DATE: 7/1/76

PROJECT DESCRIPTION:

Preliminary studies on a small scale ozonation system at Pomona indicated that the process shows promise as a secondary effluent color reduction system. Additional investigations using a 50 gpm pilot plant will be conducted to maximize the utilization of the ozone in the process, to determine the feasibility of using ozone as a pretreatment for filtration, and to determine the effects of pH, temperature, turbidity and contact time on the ozonation process for color, COD, virus and bacterial removal. Process cost estimates will be derived for the various treatments with ozonation.

PROJECT TITLE: Parallel Ozonation and Chlorination with Dechlorination of Chlorinated Effluent

EXTRAMURAL PROJECT DIRECTOR:

James S. Sheeran
Project Director
City of Wyoming, Michigan
1155 - 28th Street, SW
Wyoming, Michigan 49509

MERL PROJECT OFFICER:

Albert D. Venosa
Wastewater Research Division, MERL

PROJECT NO.: 802292 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASS

EPA SUPPORT: $1,017,982

BEGINNING DATE: 7/1/71

COMPLETION DATE: 6/30/76

PROJECT DESCRIPTION:

The primary objective of this project is to disinfect parallel streams of effluent from a secondary activated sludge wastewater treatment plant and a trickling filter wastewater treatment plant with chlorine, ozone, and bromine chloride. Part of the chlorinated effluent stream is dechlorinated with sulfur dioxide. The chlorinated, dechlorinated, bromine chloride treated, and ozonated streams, and a control stream of the same effluent are compared for their toxic effect on several species of fish and macroinvertebrates. Disinfectant dosage is controlled at levels sufficient to yield effluents having total coliform and fecal coliform counts not to exceed 1,000 per 100 ml and 200 per 100 ml, respectively.

PROJECT TITLE: Studies on the Methanogenic Bacteria in Sludge

EXTRAMURAL PROJECT DIRECTOR:

Dr. Paul H. Smith
University of Florida
Department of Microbiology
Gainesville, Florida 32611

MERL PROJECT OFFICER:

Albert D. Venosa
Wastewater Research Division, MERL

PROJECT NO.: 17070DJV (Grant)
PROGRAM ELEMENT: 1BB043
ROAP: 21ASS

EPA SUPPORT: $56,993

BEGINNING DATE: 6/1/70
COMPLETION DATE: 10/31/75

PROJECT DESCRIPTION:

The objectives of this project are to isolate the methanogenic bacteria present in digesting domestic sewage sludge and to determine those factors which control the rates of anaerobic digestion. Emphasis is being placed on methane production from intermediates in the digestion process. Hydrogen gas, acetate, propionate and butyrate are being investigated.

Isolation attempts are being made utilizing methods which give maximum control of oxygen tension. O/R potential is being maintained below-300 mv. Intermediates and rates are being investigated using isotope dilution techniques.

The hydrogen utilizing methanogenic microflora has been isolated and its ecological function has been demonstrated. Hydrogen has been shown to inhibit short chain fatty acid metabolisms. The hydrogen utilizing microflora maintains the hydrogen concentration below a toxic level.

Current studies involve efforts to develop a methane fermentation which is insensitive to environmental changes. This is being approached by selection of insensitive mixed populations of organisms capable of dissimilating organic matter.

PROJECT TITLE: Removal of Heavy Metals by Wastewater Treatment Processes

EXTRAMURAL PROJECT DIRECTOR:

Dr. Harold W. Wolf
Water Reclamation Research Center
1020 Sargent Road
Dallas, Texas 75216

MERL PROJECT OFFICER:

Dr. Irwin J. Kugelman
Wastewater Research Division, MERL

PROJECT NO.: S801026 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21AST

EPA SUPPORT: $118,166

BEGINNING DATE: 2/1/72

COMPLETION DATE: 3/1/76

PROJECT DESCRIPTION:

Removal of heavy metals such as Ag, Cd, Cr, Cu, Fe, Mu, Ni, Pb, Zn, Ba, Se, Hg, Co, Mo, As, B, and viruses by select waste treatment processes will be examined. Raw waste waters will be characterized for heavy metals content. The fate of these heavy metals will be determined as the waste water is treated using a combination of the following processes: activated sludge, dual media filtration, carbon adsorption, chemical treatment and chlorination. Virus studies will be concentrated in the tertiary treatment loop.

Studies will be performed on full scale treatment processes and pilot scale processes to arrive at a treatment train which will be suitable for water reuse and will effectively remove the heavy metals.

PROJECT TITLE: Reverse Osmosis Renovation of Secondary Effluent

EXTRAMURAL PROJECT DIRECTOR:

Lawrence R. Michaels
City of Escondido
100 Valley Boulevard
Escondido, California 92025

* PROJECT ENGINEER: (See below)

MERL PROJECT OFFICER:

Dr. Richard A. Dobbs
Wastewater Research Division, MERL

PROJECT NO.: 802004 (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21AST

EPA SUPPORT: $306,137

BEGINNING DATE: 6/1/75

COMPLETION DATE: 12/1/76

PROJECT DESCRIPTION:

This demonstration grant will meet three objectives: The performance and economics of reverse osmosis processing of municipal effluents will be demonstrated on a sufficient scale to project large plant costs with confidence; the use of renovated, demineralized secondary effluent will prevent an adverse salt balance in the Lake Hodges basin; and the safety of unrestricted reuse of reverse-osmosis-renovated secondary effluent will be demonstrated.

The project consists of installation and operation of a 150,000 gallons per day reverse osmosis unit at the existing Sunset Avenue Wastewater Treatment Plant in the City of Escondido. The de-salted effluent will be blended with an additional 150,000 gallons per day of secondary effluent and used for irrigation through an existing effluent irrigation system. A plastic-lined evaporation pond will be constructed for brine disposal during the two-year life of the project.

* PROJECT ENGINEER:

W. H. McPherson
Fluid Systems Division
Universal Oil Products
2980 N. Harbor Drive
San Diego, California 92101

PROJECT TITLE: Appraisal of Powdered Activated Carbon Processes for Municipal Wastewater Treatment

EXTRAMURAL PROJECT DIRECTOR:

A. J. Shuckrow
Battelle-Pacific Northwest
Laboratories
Richland, Washington 99352

MERL PROJECT OFFICER:

James J. Westrick
Wastewater Research Division, MERL

PROJECT NO.: 68-03-2211 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASU

EPA SUPPORT: $68,665

BEGINNING DATE: 6/3/75

COMPLETION DATE: 7/3/76

PROJECT DESCRIPTION:

The purpose of this project is to obtain a comprehensive engineering and economic assessment of the use of powdered activated carbon for the removal of organic material from wastewater. This desk-top study will include an analysis of existing data and an economic study of the various design and operating factors which affect cost and performance. Comparisons of powdered carbon processes with other organic removal processes will be included.

PROJECT TITLE: Physical-Chemical Treatment at Rocky River, Ohio

EXTRAMURAL PROJECT DIRECTOR:

Stephen J. Sebesta
County Sanitary Engineer
Cuyahoga County
1276 West Third Street
Cleveland, Ohio 44113

MERL PROJECT OFFICER:

James J. Westrick
Wastewater Research Division, MERL

PROJECT NO.: 11010 DAB (Grant)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASU

EPA SUPPORT: $991,350

BEGINNING DATE: 8/16/68

COMPLETION DATE: 1/1/77

PROJECT DESCRIPTION:

This project includes the construction and operation of a 10 MGD independent physical-chemical municipal waste treatment system utilizing chemical clarification and activated carbon adsorption for complete treatment. Complete performance data will be collected. A thorough operating and maintenance cost accounting will be made to effectively determine the actual cost of operation of such a system.

PROJECT TITLE: Physical-Chemical Treatment of Municipal Waste

EXTRAMURAL PROJECT DIRECTOR:

Dr. Don Burns
Eimco - BSP Division of
Envirotech
P. O. Box 300
Salt Lake City, Utah 84110

MERL PROJECT OFFICER:

James J. Westrick
Wastewater Research Division, MERL

PROJECT NO.: 68-01-0183 (Contract)

PROGRAM ELEMENT: 1BB043

ROAP: 21ASU

EPA SUPPORT: $394,099

BEGINNING DATE: 4/7/72

COMPLETION DATE: 2/1/76

PROJECT DESCRIPTION:

Develop powdered activated carbon-physical chemical treatment process for municipal wastewater treatment. Operated system at steady state to determine reliability under conditions of diurnal flow variation. Develop pilot thickening and dewatering of chemical sludges. Demonstrate successful regeneration and reuse of powdered activated carbon.

PROJECT TITLE: Pomona Research and Development Facility (Evaluation of Rotary Kiln for Activated Carbon Regeneration)

EXTRAMURAL PROJECT DIRECTOR:

Leon Directo
Los Angeles County Sanitary District
Los Angeles, California
(Pomona Pilot Plant
295 South Roselawn Avenue
Pomona, California 91766)

MERL PROJECT OFFICER:

Dr. Irwin J. Kugelman
Wastewater Research Division, MERL

PROJECT NO.: 14-12-150

PROGRAM ELEMENT: 1BB043

ROAP: 21ASU

EPA SUPPORT: $10,000

BEGINNING DATE: 7/1/74

COMPLETION DATE: 6/30/76

PROJECT DESCRIPTION:

An indirect fired rotary kiln will be operated in parallel with the existing multiple hearth furnace at Pomona, California. Initially, carbon from the existing large-scale tertiary pilot plant will be divided and regenerated in both furnaces. The carbon regenerated in the multiple hearth furnace will be returned to the tertiary pilot plant while that from the rotary kiln will be put in a separate column which will be run in parallel with the existing tertiary plant. After the next exhaustion cycle, the carbon batches will be kept separate and regenerated respectively in the furnaces that were used to regenerate each batch originally. This procedure will be followed for several more regeneration-exhaustion cycles. Comparison of the regeneration performance will be based on carbon loss during regeneration, change in iodine number, Malasses Number, adsorption capacity, and other common parameters. In addition, the air quality of the exhaust gas will be monitored to determine if Los Angeles County air quality standards are being met.

PROJECT TITLE: Costs of Radium Removal from Potable Water Supplies

EXTRAMURAL PROJECT DIRECTOR:

J. E. Singley, Ph.D.,
Dept. of Environmental Engineering Sciences
University of Florida
Gainesville, Florida 32611

MERL PROJECT OFFICER:

G. Logsdon
Water Supply Research Division

PROJECT NO.: 803864 (Grant)

PROGRAM ELEMENT: 1CB047

ROAP: 21AQB

EPA SUPPORT: $58,478

BEGINNING DATE: 8/1/75

COMPLETION DATE: 3/31/76

PROJECT DESCRIPTION:

The objective of the work is to determine the capital and operating costs for the removal of radium from potable water supplies.

Data will be collected from the literature and from current EPA surveys of plants having radium in their raw water.

Cost estimates will be based on the range of sizes and types of plants that will be required for different qualities of raw water.

PROJECT TITLE: Evaluation of Reuse Potential of Water Supply Systems

EXTRAMURAL PROJECT DIRECTOR:

A C T Systems Inc.
807 W. Morse Blvd.
Winter Park, Florida 32789

MERL PROJECT OFFICER:

R. Clark
Water Supply Research Div.

PROJECT NO.: 68-03-2071 (Contract)

PROGRAM ELEMENT: 1CB047

ROAP: 21AQB

EPA SUPPORT: $57,240

BEGINNING DATE: 7/73

COMPLETION DATE: 6/74

PROJECT DESCRIPTION:

Little organized data is available concerning the Financing and Operating characteristics and the relative economics of water supply utility management. The effort which has been undertaken as part of this contract will collect data in a standardized and comparable form from one major water supply utility in each of the ten EPA regions. The data will help to define the factors which influence the cost of water supply and will also be useful in assessing the relative cost of rennovated wastewater as an alternative source for water supply.

PROJECT TITLE: Planning Water Supply - Building Permits and Cost/Rate Differentials

EXTRAMURAL PROJECT DIRECTOR:

Prof. H. C. Goddard
Univ. of Cincinnati
School of Arts
Clifton Ave.
Cincinnati, Ohio 45221

MERL PROJECT OFFICER:

R. Clark

PROJECT NO.: R803596-01

PROGRAM ELEMENT: 1CB047

ROAP: 21AQB

EPA SUPPORT: $35,000

BEGINNING DATE: 7/74

COMPLETION DATE: 6/75

PROJECT DESCRIPTION:

The objectives of this research are two: (1) to undertake an analysis of the feasibility, benefits and costs of using building permit data to estimate and project the future demand by user class for water and subsequent investment in supply and distribution networks, and (2) to develop estimates of operating and capital costs, and cost and supply relationships as a function of space and topography, as related to cost/rate differentials among users of the same class and different classes (residential commercial, industrial). This aspect of the research is concerned with estimating the degree of internal cross-subsidies in the system.

The approach utilizes data from building permit applications and water supply records for the Cincinnati Water Work supply area. The analysis will utilize statistical analysis to estimate the relationships and test the appropriate hypotheses.

PROJECT TITLE: Study of the Ion Exchange Process for Nitrate Removal

EXTRAMURAL PROJECT DIRECTOR:

Dr. W. J. Weber
Dept. of Civil Engineering
University of Michigan
Ann Arbor, Michigan 84104

MERL PROJECT OFFICER:

T. Sorg
Water Supply Research Div.

PROJECT NO.: R803898-01 (Grant)

PROGRAM ELEMENT: 1CB047

ROAP: 21AQB

EPA SUPPORT: $46,000

BEGINNING DATE: 7/21/75

COMPLETION DATE: 7/20/76

PROJECT DESCRIPTION:

The objective of this project is to study various ion exchange resins for the removal of nitrates from water supplies. Specifically, weak base, anion-exchange resins and strong-acid, weak base processes will be studied for their selectivity to remove nitrates. Waste disposal methods for each system will be evaluated and the economics of the systems will be determined.

PROJECT TITLE: Demonstrate Disinfectant Capabilities of Ozone and Ultra Violet Light for Small Community Water Supplies.

EXTRAMURAL PROJECT DIRECTOR:

Kenneth M. Stone, P.E.
Vermont State Department of Health
115 Colchester Avenue
Burlington, Vermont 05401

MERL PROJECT OFFICER:

R. Buelow
Water Supply Research Div.

PROJECT NO.: 68-03-2182 (Contract)

PROGRAM ELEMENT: 1CB047

ROAP: 21AQE

EPA SUPPORT: $123,238

BEGINNING DATE:

COMPLETION DATE:

PROJECT DESCRIPTION:

The purpose of this contract is to thoroughly investigate the performance of ozone and ultra violet light as possible disinfectants of drinking water for small community water supplies.

The proposed demonstration project will involve the installation of ozone and ultra violet light disinfecting equipment on existing small water systems in Grand Isle county. The bacteriological quality of the raw water, disinfected water and water at the consumers taps will be closely monitored to ascertain the effectiveness of the disinfection and to determine if the bacteriological quality can be maintained throughout the distribution system.

Field studies will be conducted at seven small water systems in Grand Isle County. All systems serve less than 500 people and all use a common source of supply, Lake Champlain. Two systems provide filtration and chlorination, four provide chlorination only, and one provides no treatment or chlorination. Ozone and ultra violet equipment will be installed to provide for evaluations on systems with and without treatment and to compare the results with systems which chlorinate and those which provide no disinfection.

Weekly samples will be collected from each system of the raw water, treated and/or disinfected water, and water at three points in the distribution system. Routine analysis will include total coliform, fecal coliform and standard plate count as well as selected chemical and physical parameters pertinent to disinfection (pH, temperature, turbidity, ozone residuals, dissolved oxygen).

PROJECT TITLE: Determining the Organic Content of Drinking Water

EXTRAMURAL PROJECT DIRECTOR:

Albert E. Sylvia, Sanitary Biologist
Massachusetts Dept. of Public Health
Division of Environmental Health
Lawrence Experiment Station
Lawrence, Massachusetts

MERL PROJECT OFFICER:

T. Love

PROJECT NO.:

PROGRAM ELEMENT: 1CB047

ROAP: 21AQE

EPA SUPPORT: $169,000

BEGINNING DATE: 6/73

COMPLETION DATE: 6/76

PROJECT DESCRIPTION:

The objective of this study is the development of design criteria for granular activated carbon (GAC) filters used in the treatment of drinking water for the removal of taste and odors, and potentially toxic organic compounds. Studies will continue toward the development of a rapid, simple, yet reliable method of measuring and monitoring the performance of GAC filters and accurately determining the sorptive status of the carbon beds at any given time.

Specially designed pilot scale filters will be used to study the many variables associated with the use of GAC in water treatment. The principal investigator will vary the loading rates and bed depths and use different types and grades of carbon. Monitoring will include carbon adsorbables, fluorometric properties, specific (volatile) chlorinated organics, and total organic carbon. The influence on adsorption due to pretreatment with polyelectrolytes, powdered activated carbon and sand filtration will be studied and the extent of bacterial regrowth within the GAC beds will be described. Parallel testing will compare the pilot scale facility to the full-scale carbon filtration operation at the Lawrence, Massachusetts water treatment plant.

PROJECT TITLE: Examination of the Dependence of Plaque Titer on the Physical Aggregation and Disinfection of Viruses in Water Supplies.

PROJECT NO.: R802946 01 (Grant)

PROGRAM ELEMENT: 1CB047

ROAP: 21AQE

EPA SUPPORT: $35,000

BEGINNING DATE:

COMPLETION DATE:

EXTRAMURAL PROJECT DIRECTOR:

D. Gordon Sharp
Prof. of Biophysics
School of Medicine, Dept. of Bacteriology
University of North Carolina,
Chapel Hill, North Carolina 27514

MERL PROJECT OFFICER:

J. Hoff
Water Supply Research Div.

PROJECT DESCRIPTION:

The plaque method for assay of infectious virus in natural water will be examined in order to determine the effects of virus particle aggregation. Physical assay by quantitative electron microscopy will be employed to determine the number of single viruses, pairs, triplets, etc., present in water suspensions of the virus. Correlation of these physical data with plaque titer of virus in different states (degrees) of aggregation will be sought for several viruses commonly found in water.

Previous work with large viruses indicates that the degree of clumping may alter the plaque titer by one or more orders of magnitude particularly if the virus has been partially degraded. Multiplicity Reactivation, evidenced through clumping, will be examined. A major part of this project will be the adaptation of physical assay methods, now used with large viruses to similar work with the picorna viruses. When this has been accomplished it will be possible to proceed with direct observation of virion aggregation in natural water, as compared with optimum buffered saline solutions commonly used in the laboratory. Rational interpretation of plaque assay of such water suspensions can then be made with full consideration of virion clumping.

PROJECT TITLE: Organic N-Chloro Compounds in Chlorination of Water Supplies

EXTRAMURAL PROJECT DIRECTOR:

Professor J. Carroll Morris,
Prof. of Engineering & Physics
Harvard University
Cambridge, Mass. 02138

MERL PROJECT OFFICER:

Edward Katz

PROJECT NO.: 803631-01 (Grant)

PROGRAM ELEMENT: 1[illegible]B047

ROAP: 21AQE

EPA SUPPORT: $36,787

BEGINNING DATE: 04/01/75

COMPLETION DATE: 09/30/77

PROJECT DESCRIPTION:

Objectives: To discover the forms of organic nitrogen in natural waters that interferes with chlorination and to develop methods to avoid this problem.

Approach: To identify organic nitrogen compounds in natural waters and subject them to chlorination and analyze for chlorinated products.

Current plans are to concentrate water of a typical natural source and concentrate organic compounds prior to isolation and identification. A second approach being implemented is a chlorinated two-ring organic nitrogen compound and analyzing products via UV spectroscopy. Further refinements of these techniques with other instrumentation will be forthcoming.

PROJECT TITLE: Virus Sensitivity to Chlorine Disinfection of Water Supplies

EXTRAMURAL PROJECT DIRECTOR:

R. S. Engelbrecht,
Prof. of Environ. Engr.,
Dept. of Civil Engineering
University of Illinois at Urbana-Champaign
Urbana, Illinois 61801

MERL PROJECT OFFICER:

J. Hoff
Water Supply Research Division

PROJECT NO.: R803346 02 (Grant)

PROGRAM ELEMENT: 1CB047

ROAP: 21AQE

EPA SUPPORT: $15,000

BEGINNING DATE:

COMPLETION DATE:

PROJECT DESCRIPTION:

The sole purpose of disinfecting potable water supplies is the destruction of pathogenic organisms and, thus, the elimination and prevention of waterborne disease such as those caused by viruses. The overall objective of the study is to determine the range of sensitivity of various enteric viruses (e.g. picornaviruses) to chlorine. Using carefully controlled laboratory experiments, the sensitivity response will be characterized with respect to such variables as type of virus, level and nature of chlorine, and quality of the suspending medium (water). Both chlorine demand free water and natural waters will be used. The sensitivity of viruses continuously maintained under laboratory conditions will be compared to new isolates obtained from fecal matter. The mechanism of inactivation, with respect to whether the viral genome or protein coat is affected, and whether the inactivation is reversible, will also be examined.

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